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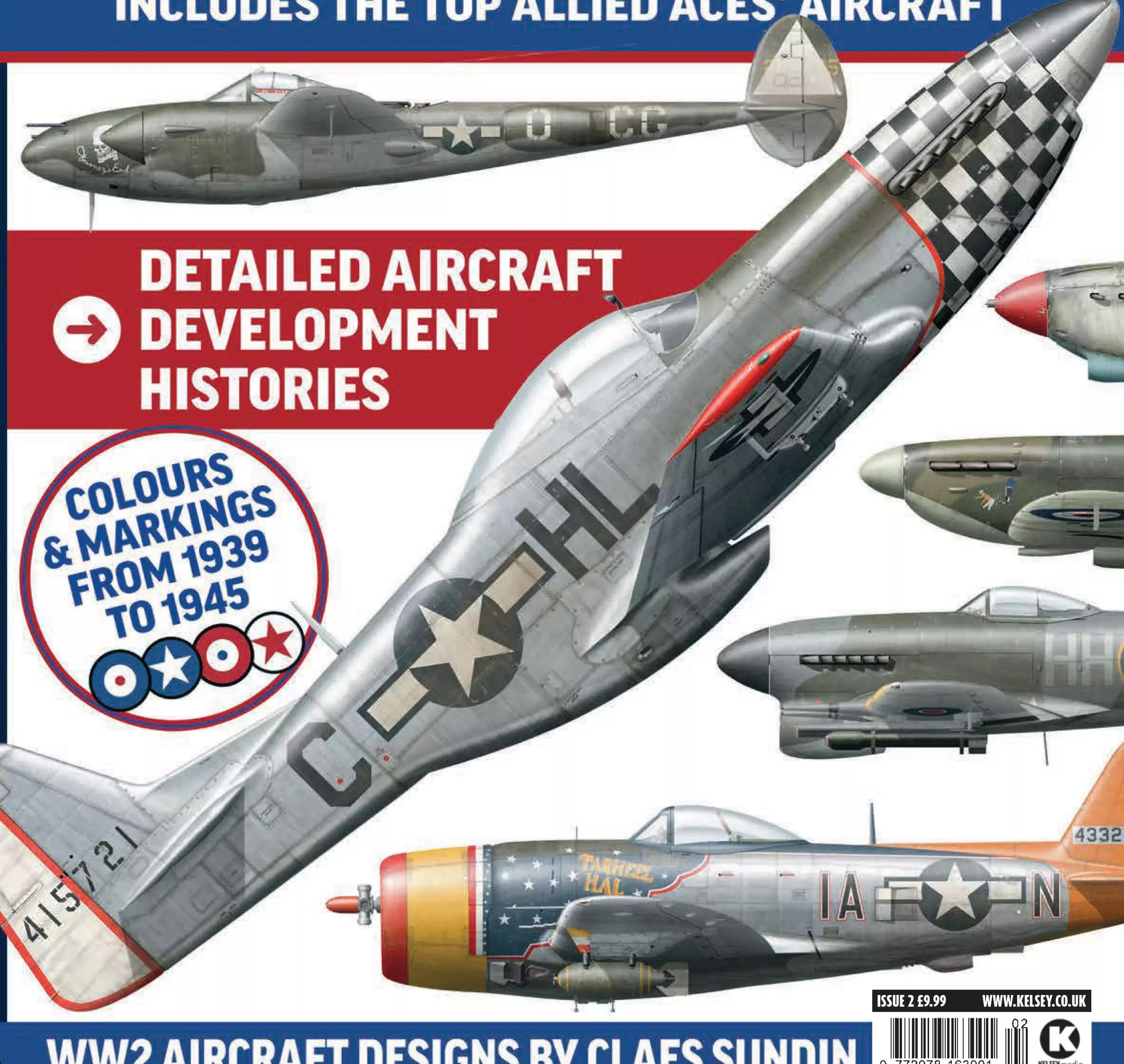
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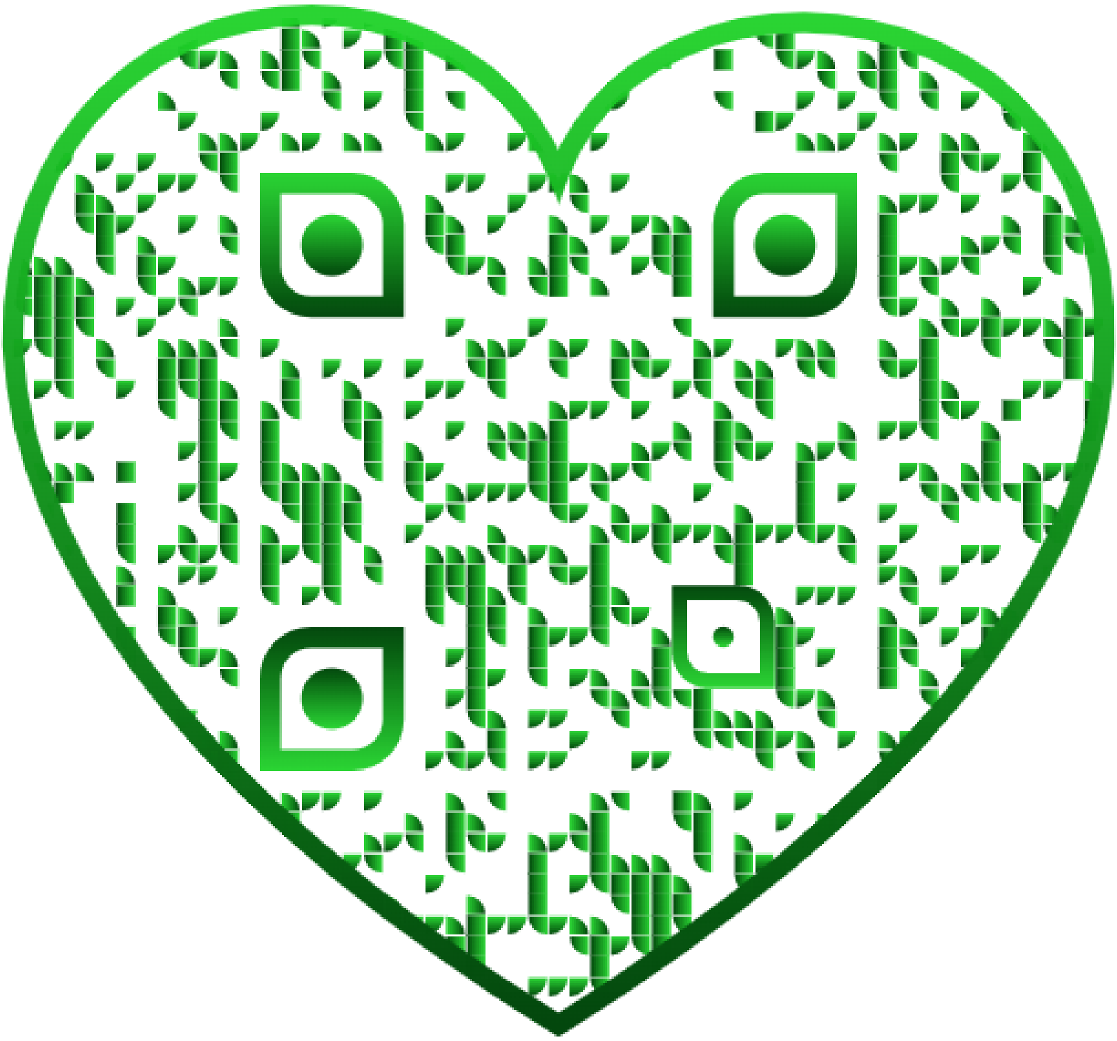

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# INTRODUCTION

When the Second World War began in 1939, despite the many signs that conflict was imminent, no nation was truly ready for it – including the Germans. Yet German forces surprised even themselves by steamrollering their way through Europe, the Luftwaffe's advanced fighters largely able to overcome their less able opponents.

The only nation able to withstand the Nazi ground assault was Great Britain – in large part due to the protective barrier formed by the English Channel. In the air, it was a different story however. Thanks to its own advanced fighters and the skill and heroism of its pilots, the RAF alone was able to hold its own against the full and growing might of the Luftwaffe for more than a year – with the rest of Europe defeated, neutral or siding with the Germans, and the Soviets and the USA remaining neutral.

During this time, neither of these latter two nations possessed fighter aircraft capable of tackling the Luftwaffe's best on equal terms. However, as Britain continued to resist, they both ploughed massive resources into improving their fighters – resulting in many of the types included in this publication.

When the Soviets were forced into the war by the German invasion commencing on Sunday, June 22, 1941, their next generation aircraft were not ready and huge problems were encountered during the development of types such as the LaGG-3, MiG-3 and Yak-1. The German war machine destroyed outdated and unreliable Soviet aircraft in their thousands before the tide was finally turned.

The USA, for its part, was able to draw upon British combat experience and some of its best late-war fighters were derived directly from interaction with the British – the Mustang was originally designed for use by the RAF. By the time the USA was dragged into the war by the attack on Pearl Harbor on Sunday, December 7, 1941, it had the beginnings of a fighter force to be reckoned with.

During the final year of the war, all three of these Allies were operating hugely powerful and capable fighters that could not only take on the Luftwaffe's best but overmatch them.

Allied Fighters examines the fighter aircraft flown by the RAF, Soviet VVS and US Army Air Force during that time and presents detailed illustrations of notable individual machines.

**Dan Sharp**

# ABOUT CLAES SUNDIN

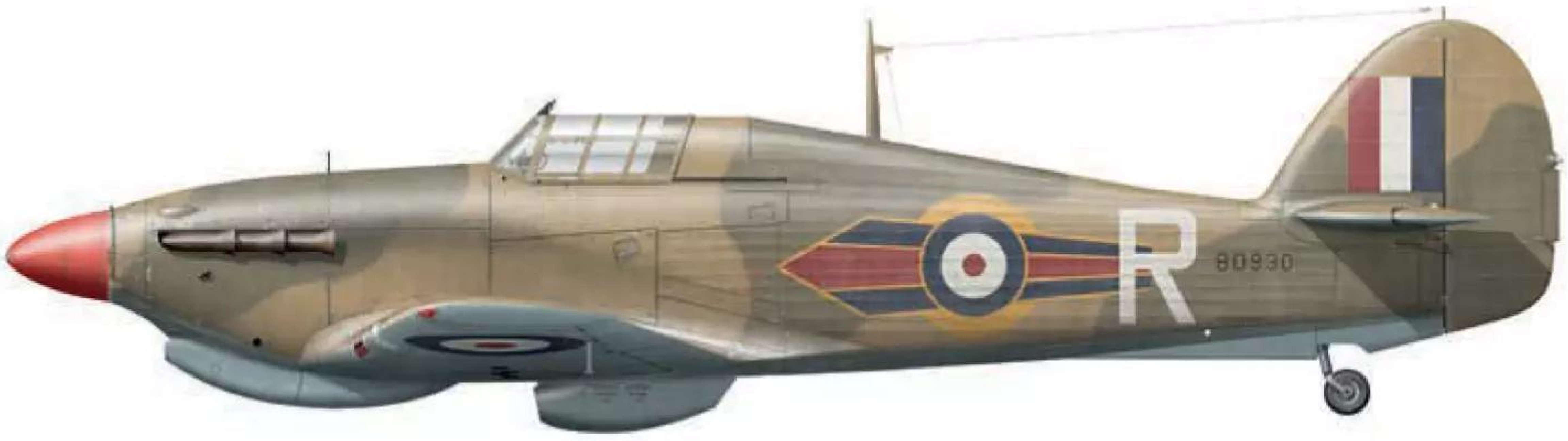
Illustrator and author Claes was born in 1957 and lives in the southern part of Sweden. Since finishing four years of studies at the University of Uppsala, he has been active as a teacher, marketer, photographer and art director, among other occupations.

Since childhood, Claes has had a strong interest in everything concerning the combat aircraft of the Second World War and later. This interest stems from the time when he, as a boy of seven, started building and collecting plastic scale models. Simultaneously, he has been a keen draftsman for as long as he can remember, as well as an accomplished CGI artist in more recent years. At present, Claes is producing books, writing articles and lecturing. Up to now he has produced more than 2000 CGI profiles, mostly of aircraft, but also of Second World War armour.

His previously published books include: Luftwaffe Fighter Aircraft in Profile (1997), Deutsche Jagdflugzeuge (1998), More Luftwaffe Fighter Aircraft in Profile (2002), Luftwaffe Fighter Aircraft, Limited Edition (2011), Luftwaffe Fighter Aircraft, Profile Book No 1 (2013), Allied Fighter Aircraft, Profile Book No 2 (2013), Tiger and Panther Tanks (2014), Luftwaffe Fighter Aircraft, Profile Book No 3 (2014), Luftwaffe Attack Aircraft, Profile Book No 4 (2015), Profiles of German Tanks (2015), Luftwaffe Night Fighters, Profile Book No 5 (2016) and Luftwaffe Fighter Aircraft, Profile Book No 6 (2016). In addition, he has provided aircraft and tank profiles, photo refinement, and artwork for many other books and papers.

Claes says: "As a long time profile artist, I am well aware that a few of the profiles included in this publication will be the subject of some criticism. The reader however, must acknowledge that all the profiles included are based on solid photographic documentation. I will always use at least one reference photo, more if available, of the subject. I seek the best photos available for the related closeup details as well.

"However, misinterpretations could naturally occur, especially regarding the colours I've chosen for the different profiles. One has to appreciate the difficulty of interpreting the colours from dated black and white photographs. But know that I have, together with my colleagues, made the utmost effort to determine the actual appearance and colouring of the individual aircraft profiles presented here."



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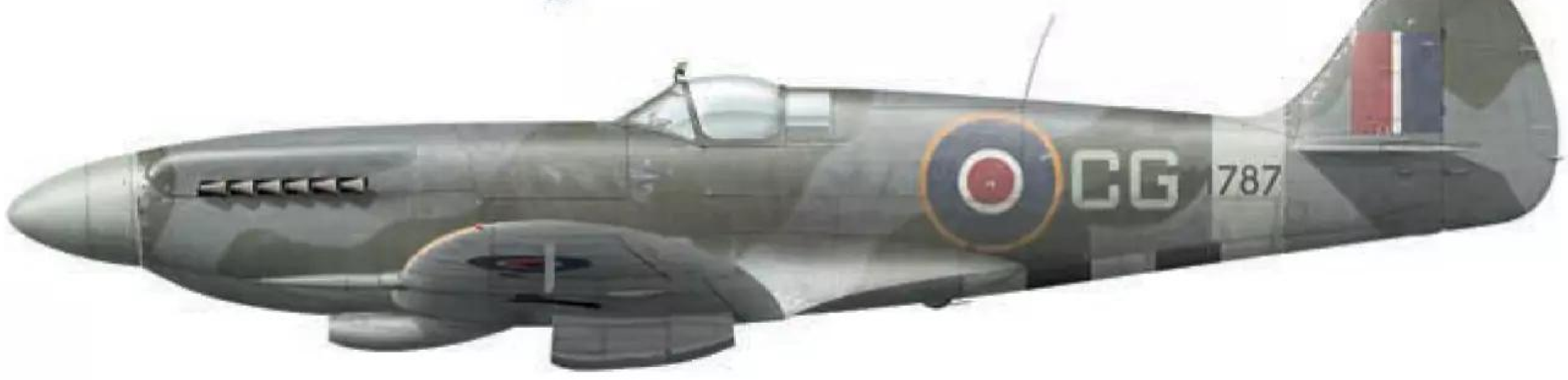

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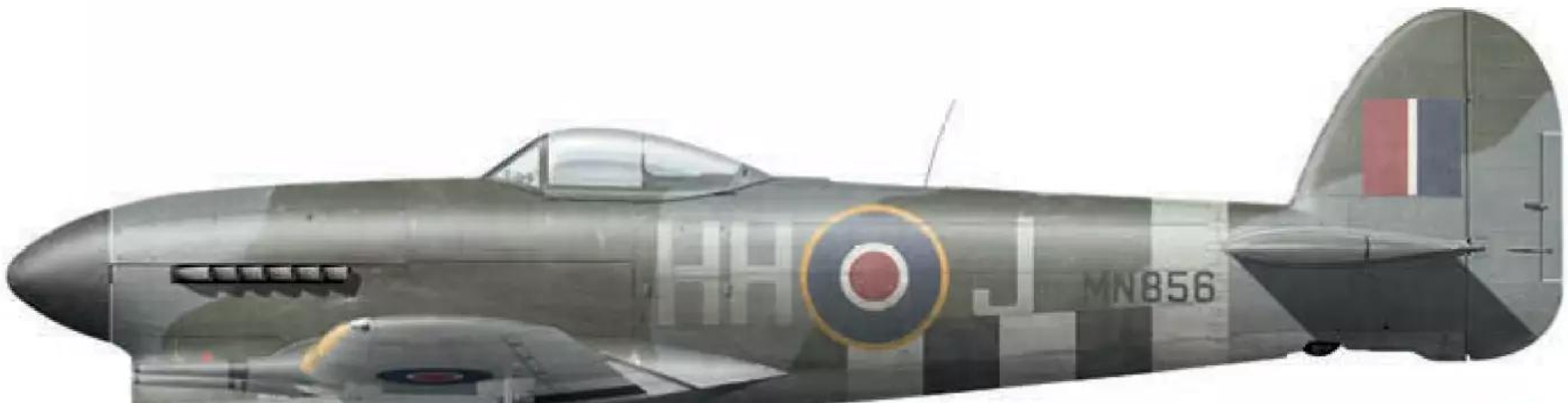

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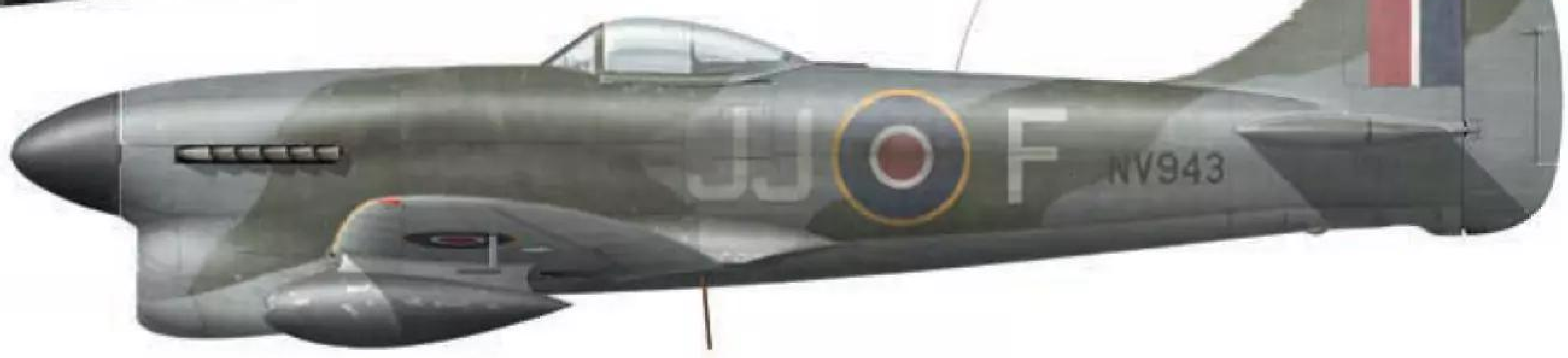

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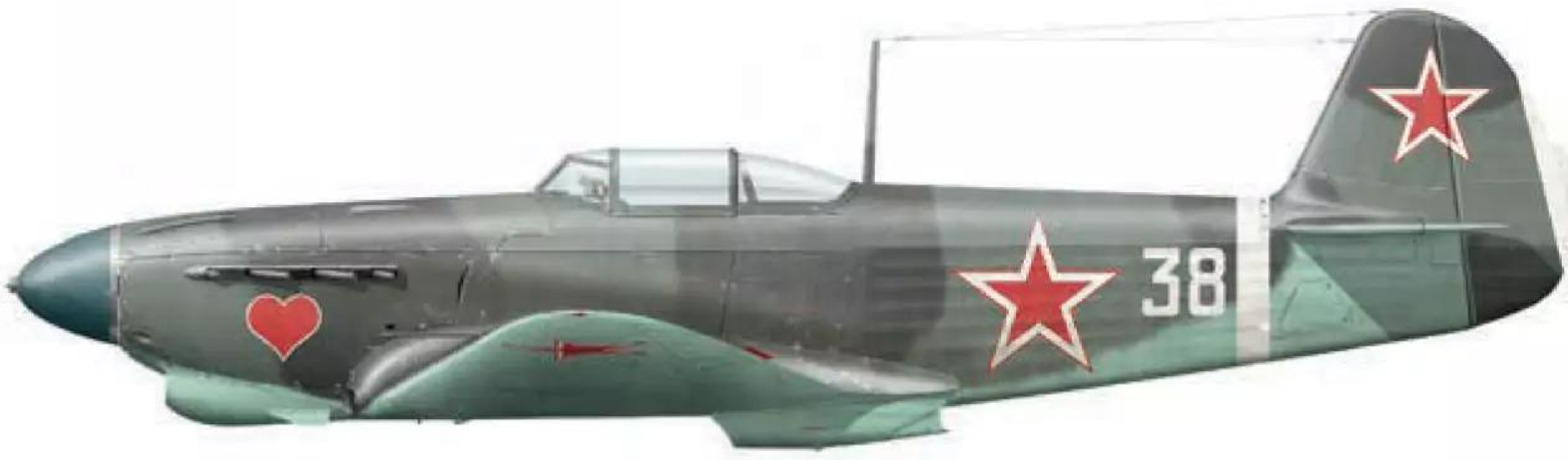

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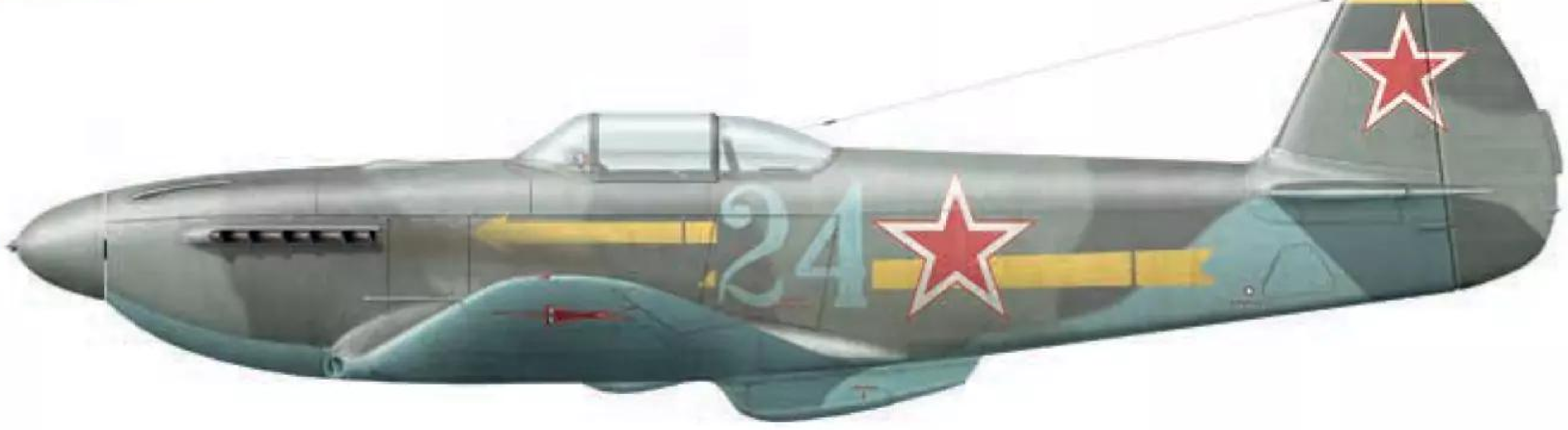

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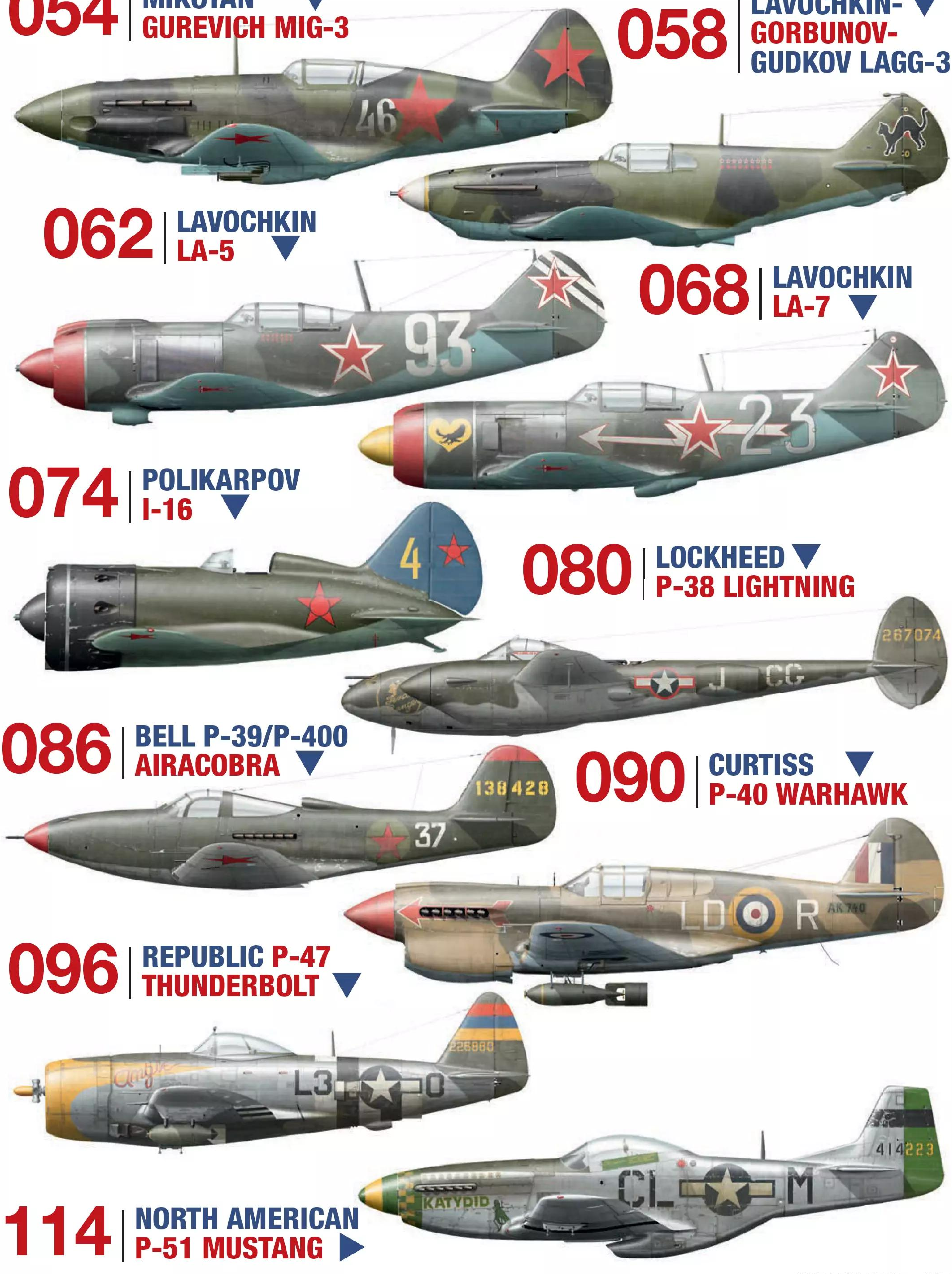
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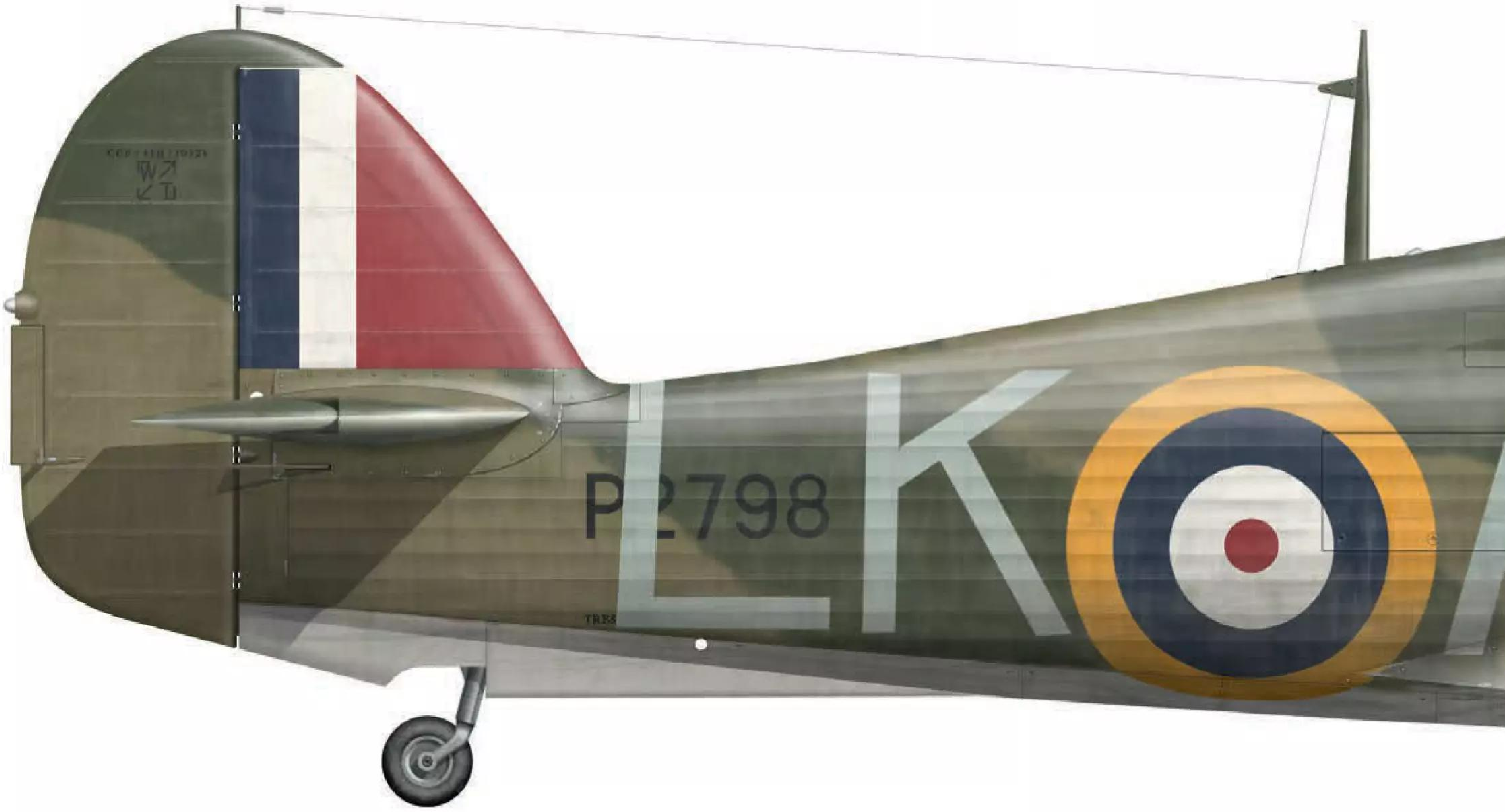


1935-1944

**Hawker's legendary Hurricane must be in the running for most highly regarded British combat aircraft of all time and its vital importance to the RAF during the early years of the war cannot be overstated.**

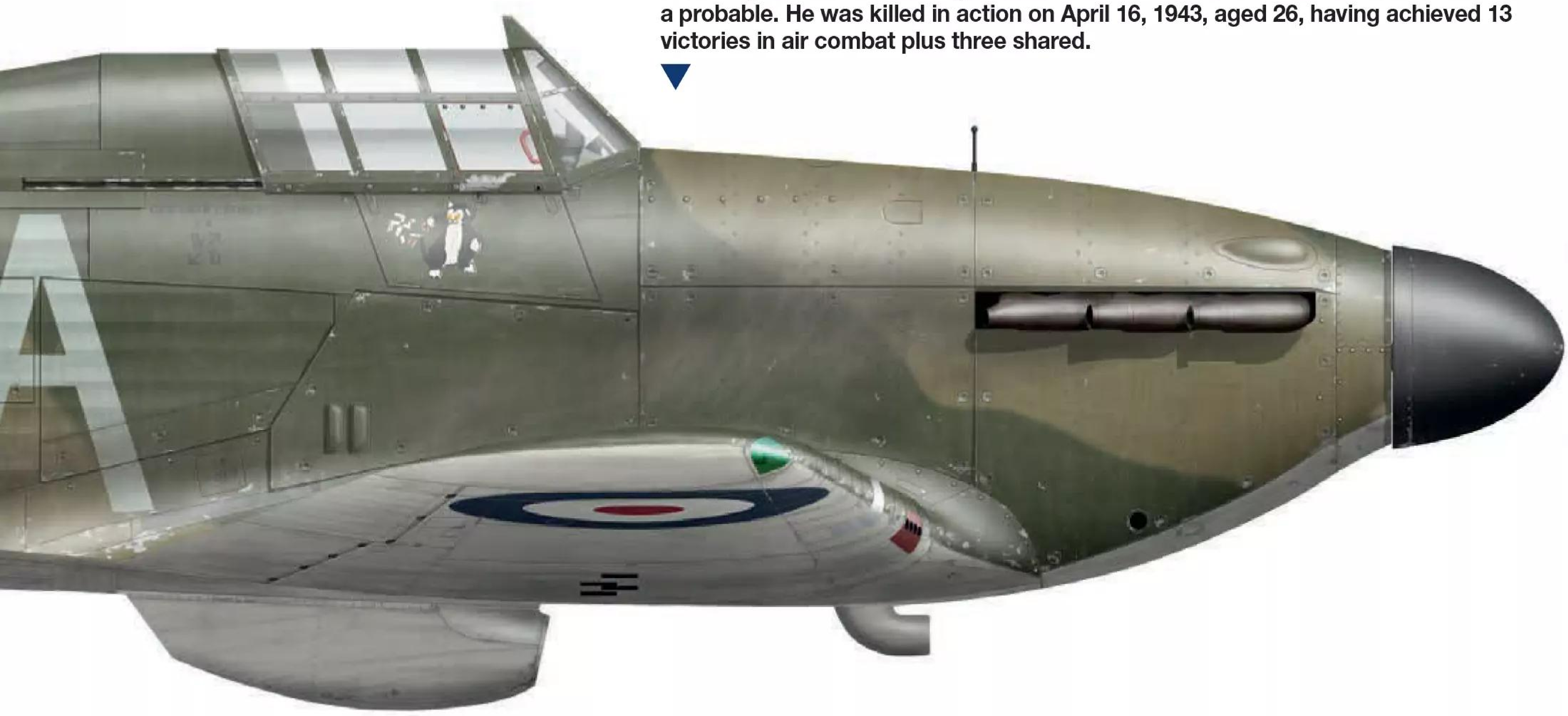
The Hurricane that first appeared in 1935 was the ultimate product of a successful evolutionary line, beginning nearly a decade earlier with the Hawker Hart – a two-seater biplane light bomber.

Designed during peacetime when defence budgets were small, the Hart nevertheless attracted substantial interest. Hawker capitalised on this by developing a wide range of variants based around the same winning features – an aerodynamic airframe and powerful Rolls-Royce V12 engine – and among these was a single-seat fighter, the Hawker Fury.

Fitted with a Rolls-Royce Kestrel engine, the Fury became the first British fighter to exceed 200mph in level flight. Its aerobatic performance and rate of climb were exceptional too, but relatively few examples were ordered as the country struggled through the ravages of the Great Depression.

With the economy turning a corner, in 1933 Hawker entered into discussions with the Air Ministry concerning a proposal to develop the Fury as a new monoplane fighter. The company's chief designer, Sydney Camm, had come up with a suitable design by January 1934 but revisions were required by the ministry including an enclosed cockpit and retractable undercarriage. With these added, a new specification was drawn up around the design in August 1934. Six months later, Hawker was awarded a contract to build a prototype of the new single-seater and the firm's engineers set to work.

# RICANE



**HAWKER HURRICANE MK.I**

**This aircraft, P2798, was flown by Pilot Officer Ian R Gleed of 87 Squadron, based at Lille-Seclin in France during mid- to late-May 1940. Gleed joined the unit as a replacement on May 17 and quickly became an ace, destroying a pair of Messerschmitt Bf 110 Cs the following day, then two Dornier Do 17 Zs and a Bf 109 E the day after – also sharing in an He 111 and with another Bf 109 E claimed as a probable. He was killed in action on April 16, 1943, aged 26, having achieved 13 victories in air combat plus three shared.**

Construction was completed within nine months and the resulting aircraft, serial K5083, first flew on November 6, 1935, powered by a Rolls-Royce PV-12 – the earliest version of what would later be renamed Merlin. The aircraft had a metal cross-braced fabric-covered fuselage, fabric-covered wings and a tailplane supported by struts. Armament was to be four .303in Browning machine guns in each wing, though a version with four 20mm cannon had been proposed and rejected.

In early 1936, after company tests, K5083 was sent to the Aircraft and Armament Experimental Establishment at Martlesham Heath for handling trials. Finally, in mid-1936 the aircraft was given the name Hurricane and put into full scale production with an order for 600 examples on the company's books.

But even as production lines were being prepared, the Hurricane was undergoing a redesign. Its engine controls were revised, its engine mountings were altered and its nose cowlings were changed to accommodate a new powerplant – the 1030hp Merlin II.

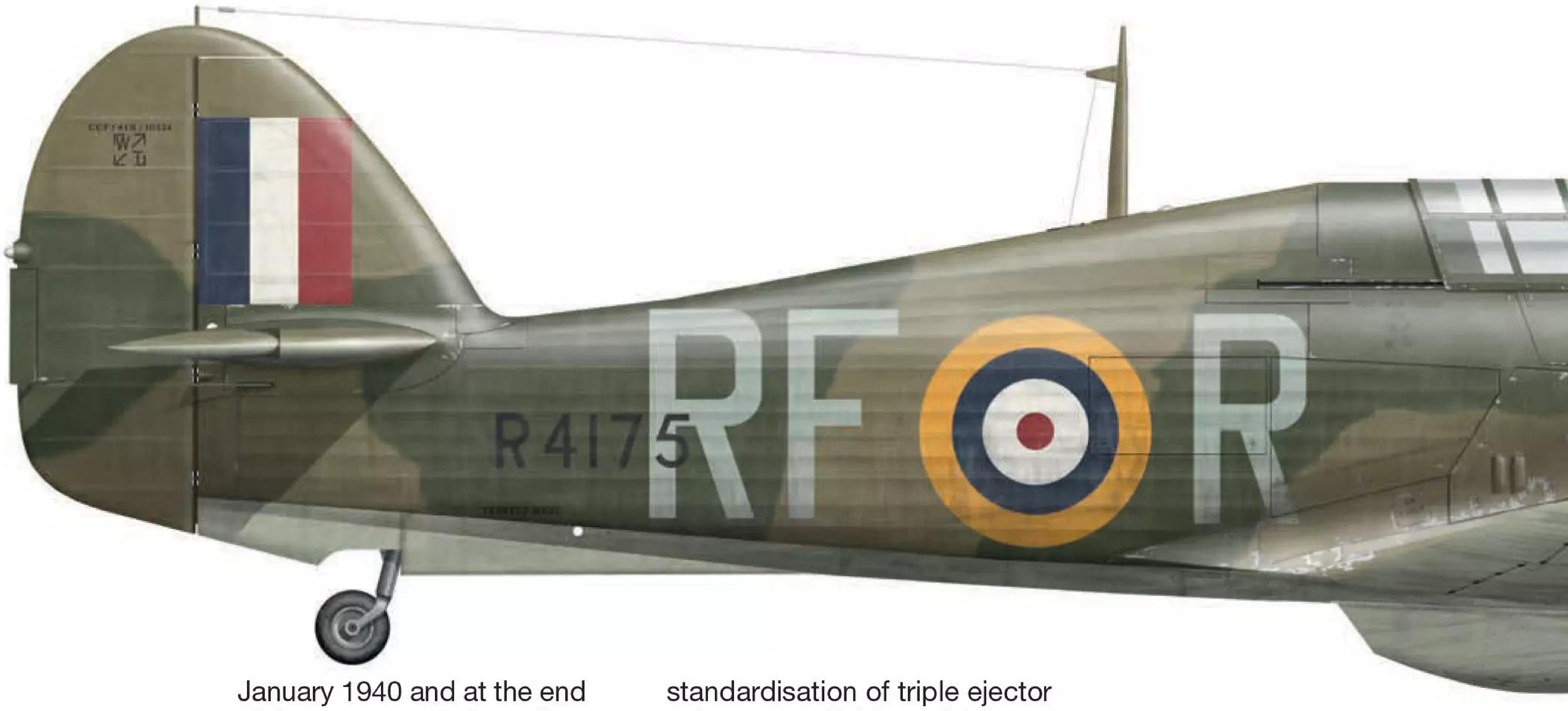
This resulted in further delay and it would be over a year from the production order being placed to the first production model aircraft being flown, on October 12, 1937. Once the design was frozen, however, the experienced Hawker workshop crews were able to turn out Hurricanes more rapidly than expected. They made 40 in the first three months and 111 Squadron, stationed at Northolt, received enough machines to equip a flight before Christmas 1937.

Spin trials necessitated an on-the-run modification at this point and a larger rudder was fitted in addition to an under-fin. These began to appear on Hurricanes reaching squadrons from February 1938 onwards. Some 200 Hurricanes had reached units by the end of 1938 and the British government had placed a second order, for another 1000, in the meantime.

The aircraft was proving to be such a success that several foreign governments ordered it too, including Romania, Yugoslavia and Belgium. Hawker had by now completed a new factory at Langley to help build it and a deal was signed on January 4, 1939, for the Canadian Car and Foundry Company to build it under licence in Canada.

The first Canadian Hurricane, a Mk.I, flew in

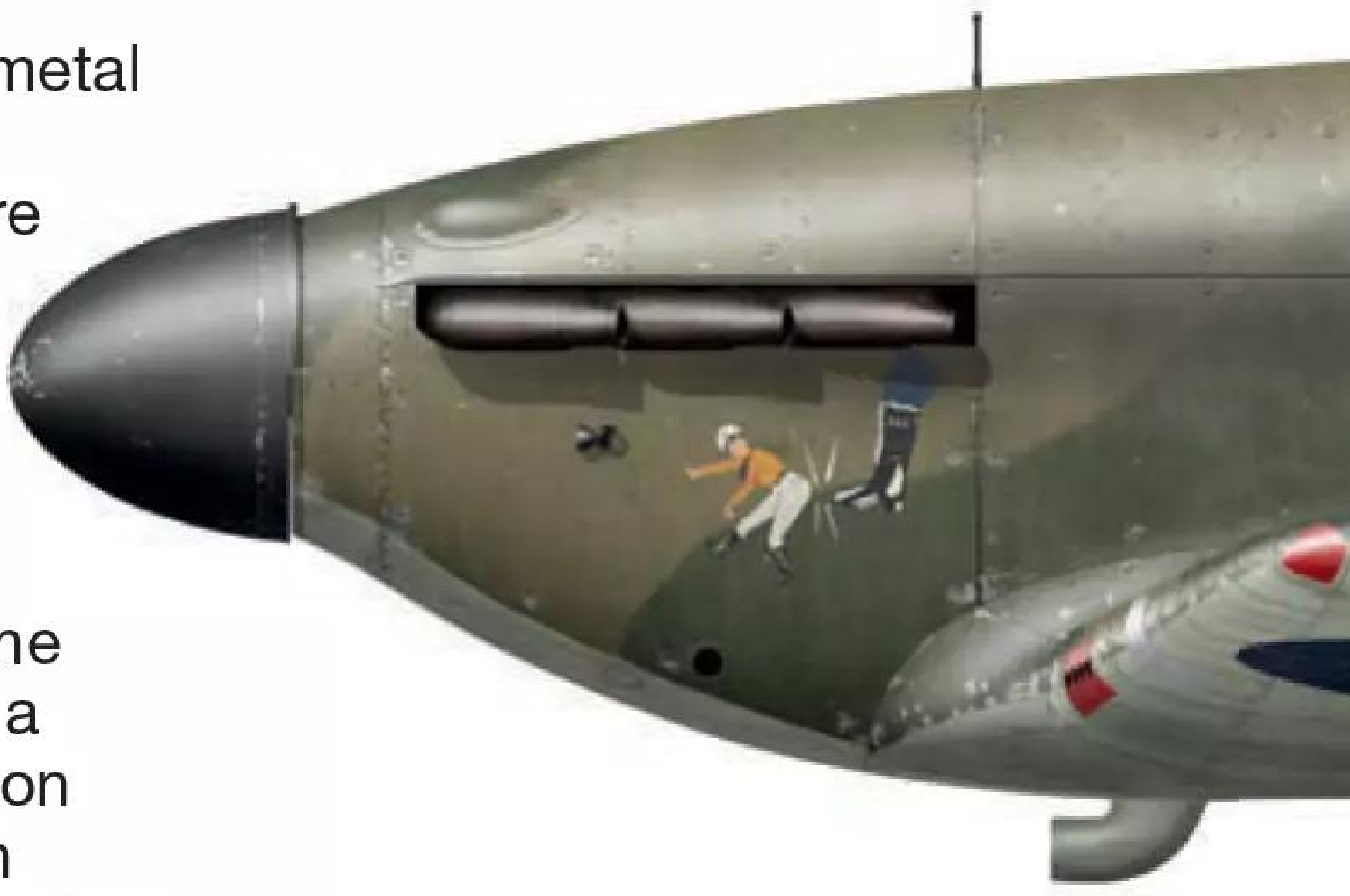
**THE FIRST HURRICANE UNIT BEGAN TO RECEIVE ITS MACHINES TOWARDS THE END OF 1937**



January 1940 and at the end of that year a new Canadian-exclusive variant was created, the Mk.X, which was powered by a Packard-built Merlin 28 engine and had 12 Browning machine guns corresponding to the Hurricane Mk.IIB in England. A Mk.XI was made in small numbers as a trainer with a modified throttle system but the major Canadian production model was the Mk.XII, first flown in November 1941. A later version with only eight guns was designated the Mk.XIIA.

Meanwhile, further design changes up to the beginning of 1939 in England included the replacement of the Merlin II with the 1310hp Merlin III, standardisation of triple ejector exhaust manifolds and the adoption of a three-bladed de Havilland two-pitch propeller. There was a move towards replacing the fabric wing covering with a stressed metal skin too.

Experimental trials were conducted with tropical filters and sand guards, in the increasingly likely event that the Hurricane would be required to fly in the Middle East, and one machine was tested with a 20mm Oerlikon autocannon fitted in a pod under each wing. Later in the year another new engine, the Merlin XII, was trialled.



## HAWKER HURRICANE MK.I

**Having joined the RAF in 1935, Robert S Tuck of 257 Squadron was promoted to squadron leader in September 1940. V6864 was his Hurricane while based at Coltishall, England, during December 1940. On January 28, 1942, he was hit by anti-aircraft fire, forced to land in occupied France and taken prisoner. By that time he had achieved 29 victories plus two shared. He later escaped from Stalag Luft III on February 1, 1945, and spent time fighting alongside Russian troops before returning home via the British embassy in Moscow.**

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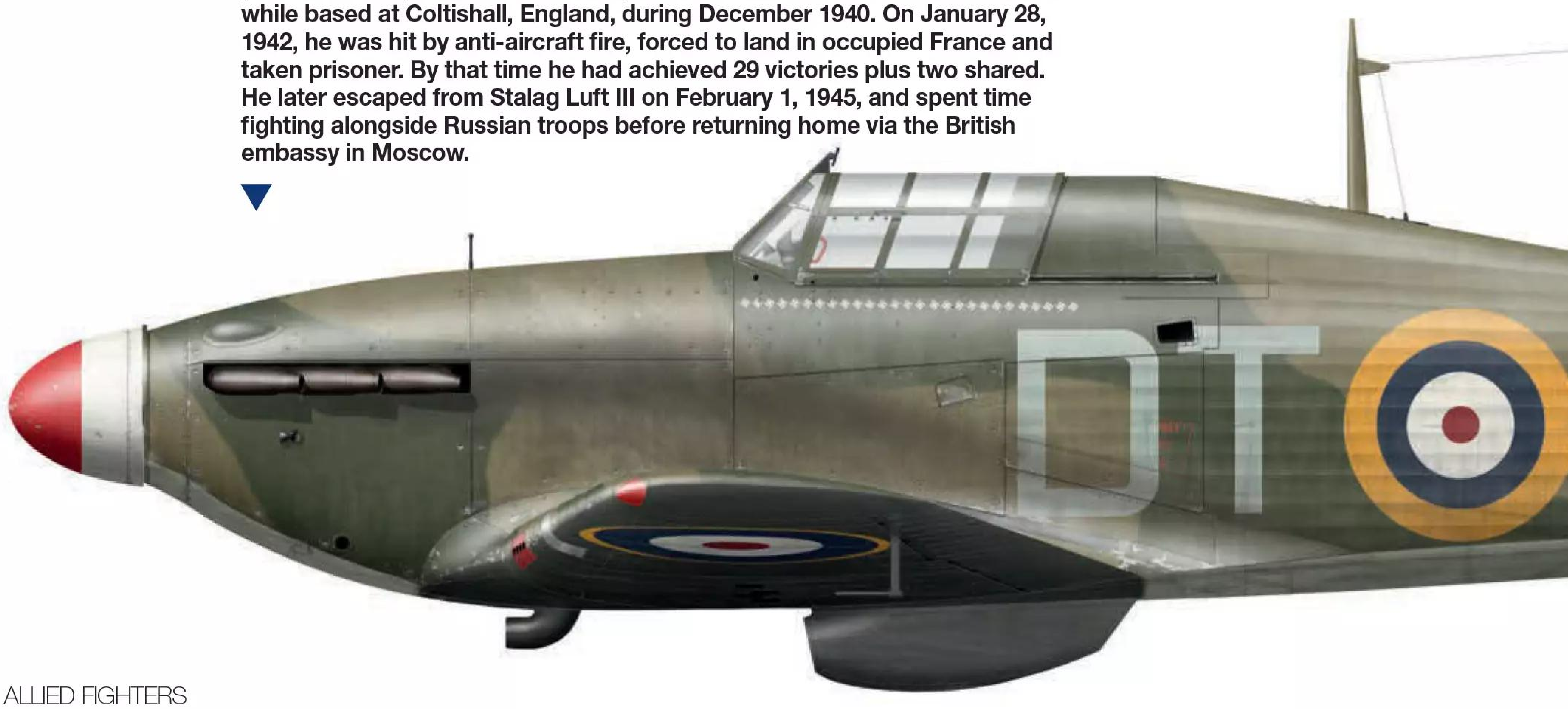
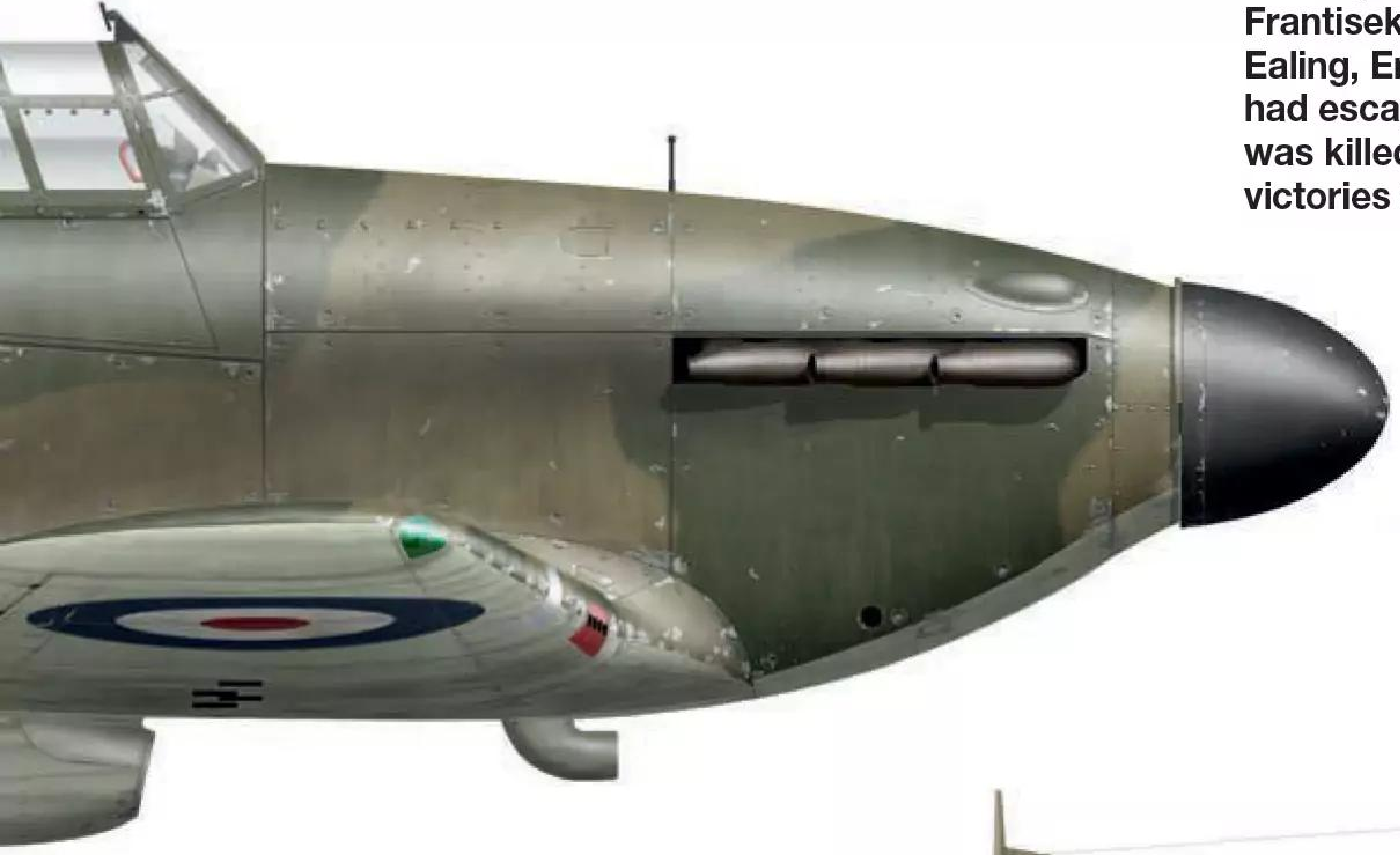


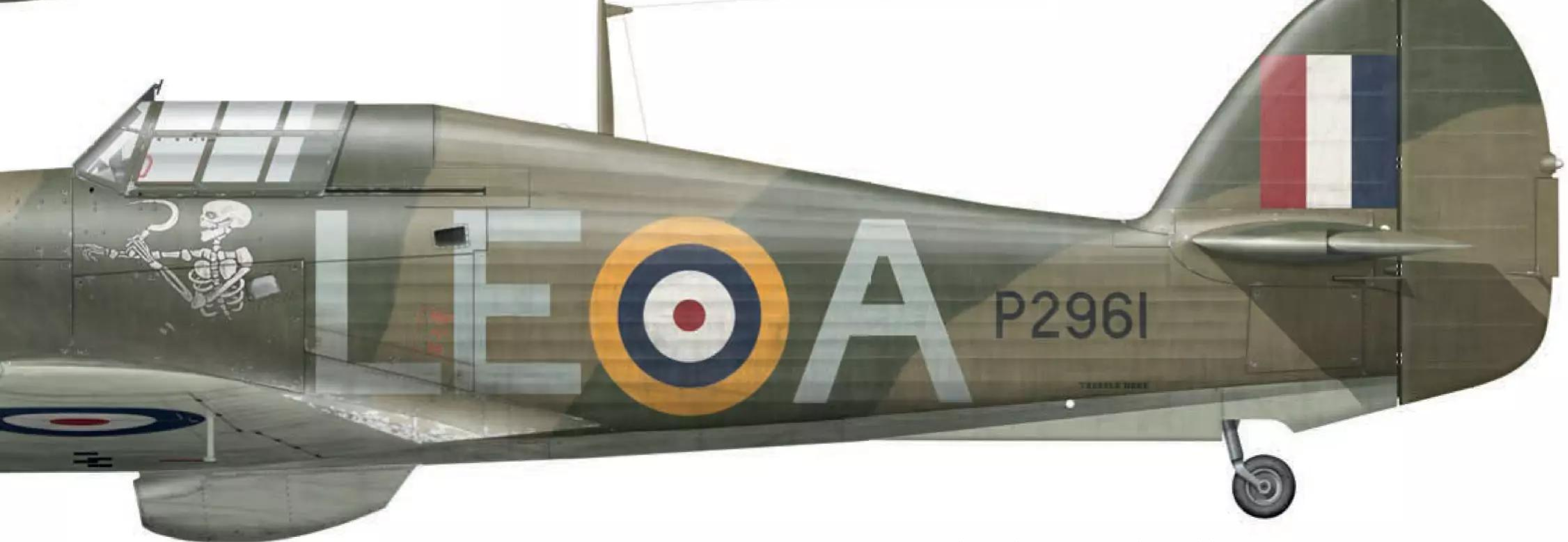


## HAWKER HURRICANE MK.I

**The highest scoring RAF pilot during the Battle of Britain was Sergeant Josef Frantisek of 303 (Polish) Squadron. He flew R4175 while based at Northolt, Ealing, England, during August 1940. Frantisek, who was actually a Czech, had escaped to Poland in 1938 when the Nazis occupied Czechoslovakia. He was killed in a flying accident on October 8, 1940, with a total of 17 air combat victories to his name.**

## HAWKER HURRICANE MK.I

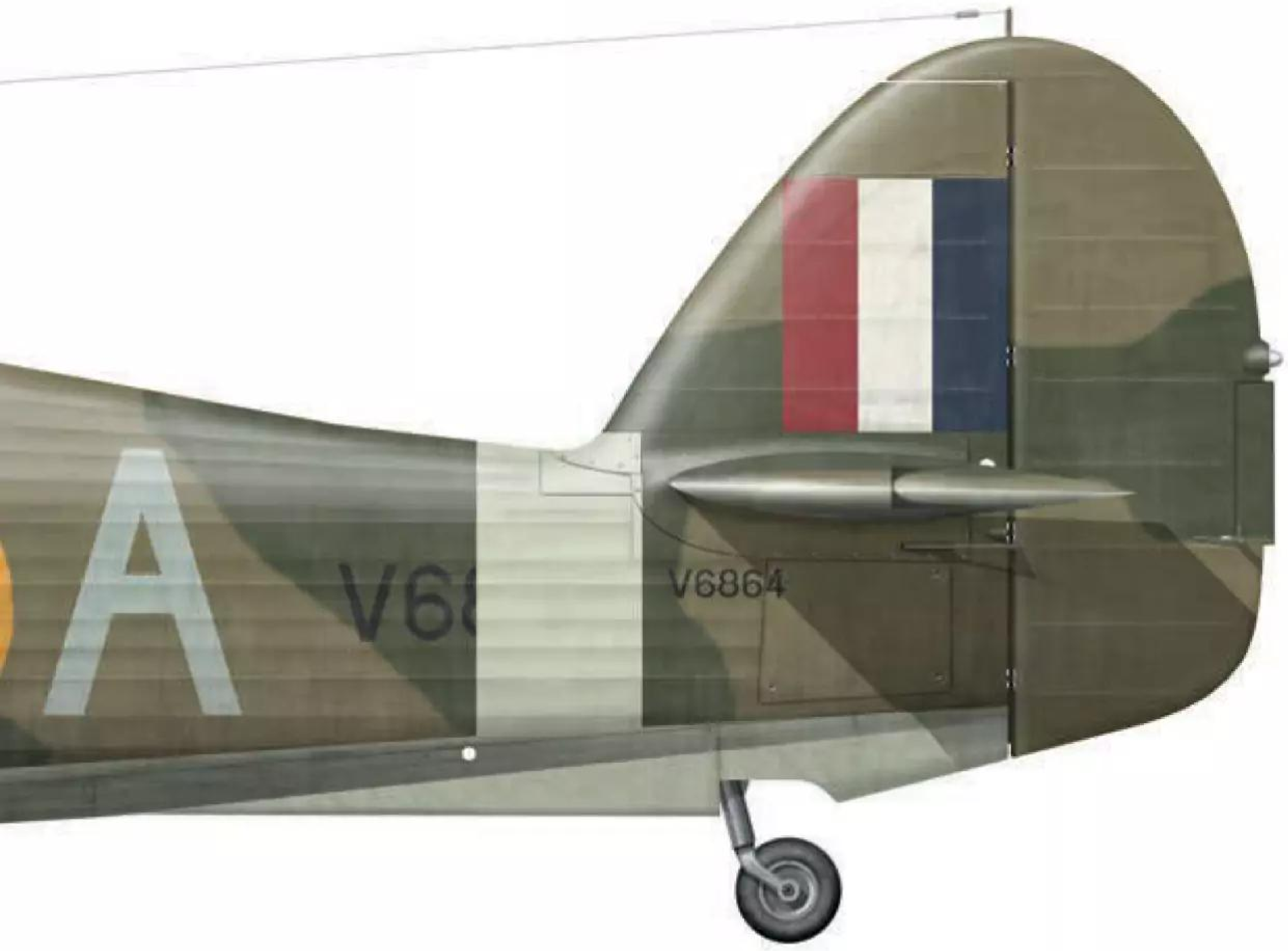
**Flying Officer William L 'Willie' McKnight, of 242 Squadron based at Duxford, England, flew P2961 with its distinctive half skeleton and boot-kicking-Hitler artwork during September 1940. McKnight was the second Canadian ace of the war and had 17 victories in air combat plus two shared when he was shot down and killed, aged 22, on January 12, 1941, while taking part in a fighter sweep over Calais.**



When the Second World War began, on September 3, 1939, there were 19 RAF squadrons flying a full complement of Hurricanes. It was one of these aircraft, a 1 Squadron Hurricane flown by Pilot Officer Peter 'Boy' Mould, that would score the RAF's first air-to-air victory of the war – shooting down a German Dornier Do 17 P reconnaissance aircraft near Toul in France on October 30, 1939.

During the invasion of Norway in 1940, it became evident that the RAF lacked fighters equipped for long-range operations, particularly over water, and Hawker began working on the provision of new underwing fuel tanks, floats and ski undercarriages for the Hurricane. The firm also continued to ramp up production – the RAF's Fighter

**A HURRICANE SCORED THE RAF'S FIRST AERIAL VICTORY OF THE WAR ON OCTOBER 30, 1939**



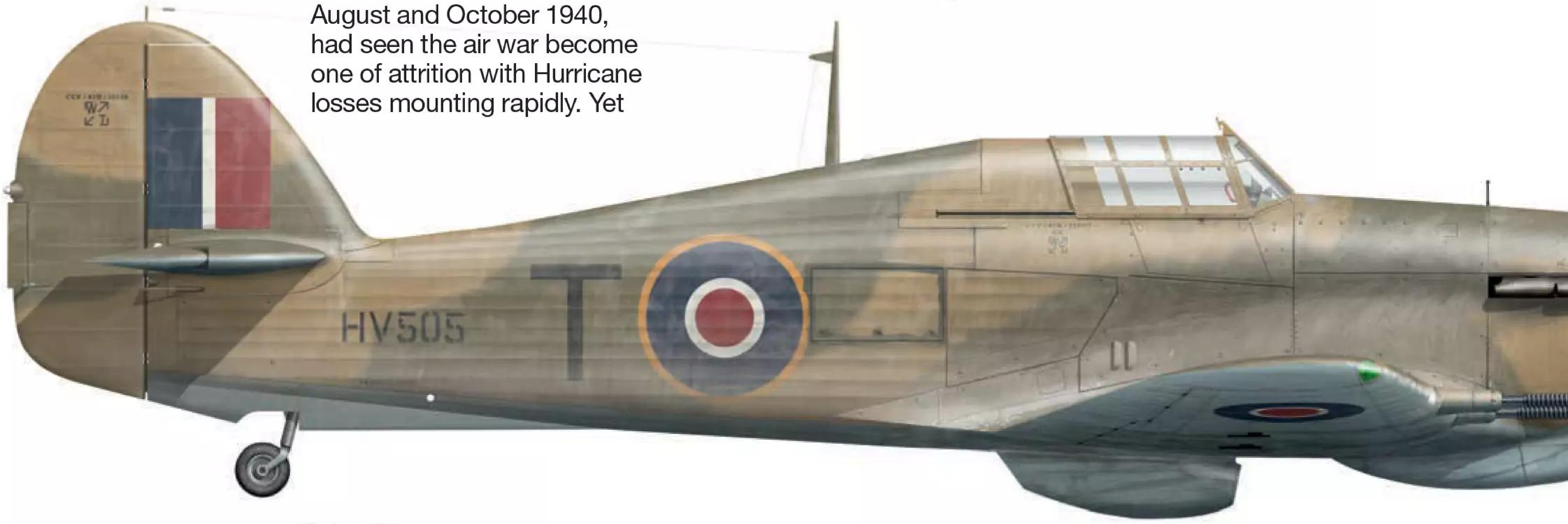
Command had an average of 1326 Hurricanes on strength between July 10 and October 31, 1940.

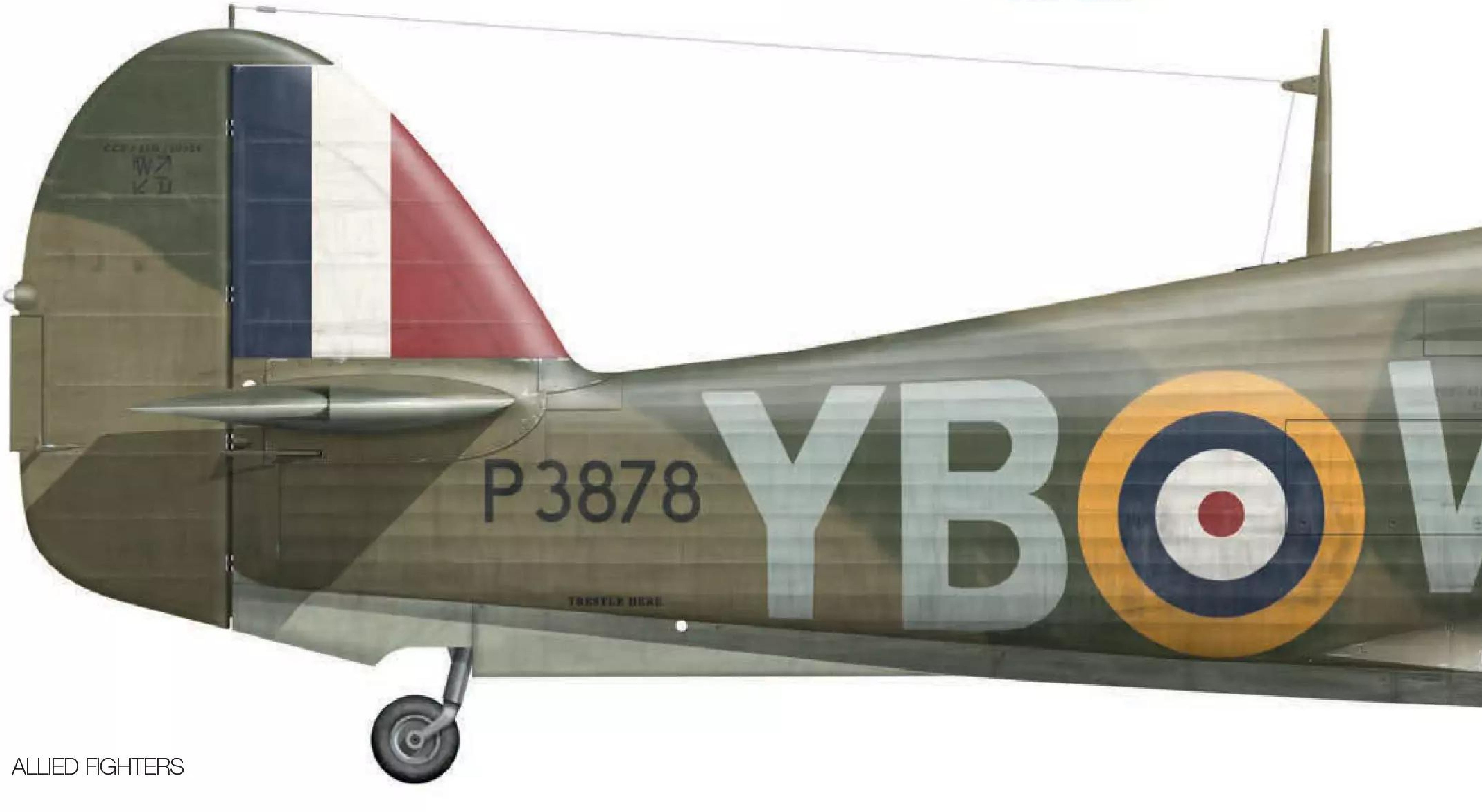
Another Rolls-Royce Merlin, the XX, became standard equipment from August 1940 – resulting in the Hurricane Mk.IIA. Front line units began to receive these from September, but the design continued to evolve with the Mk.IIA Series 2 featuring a slightly lengthened nose.

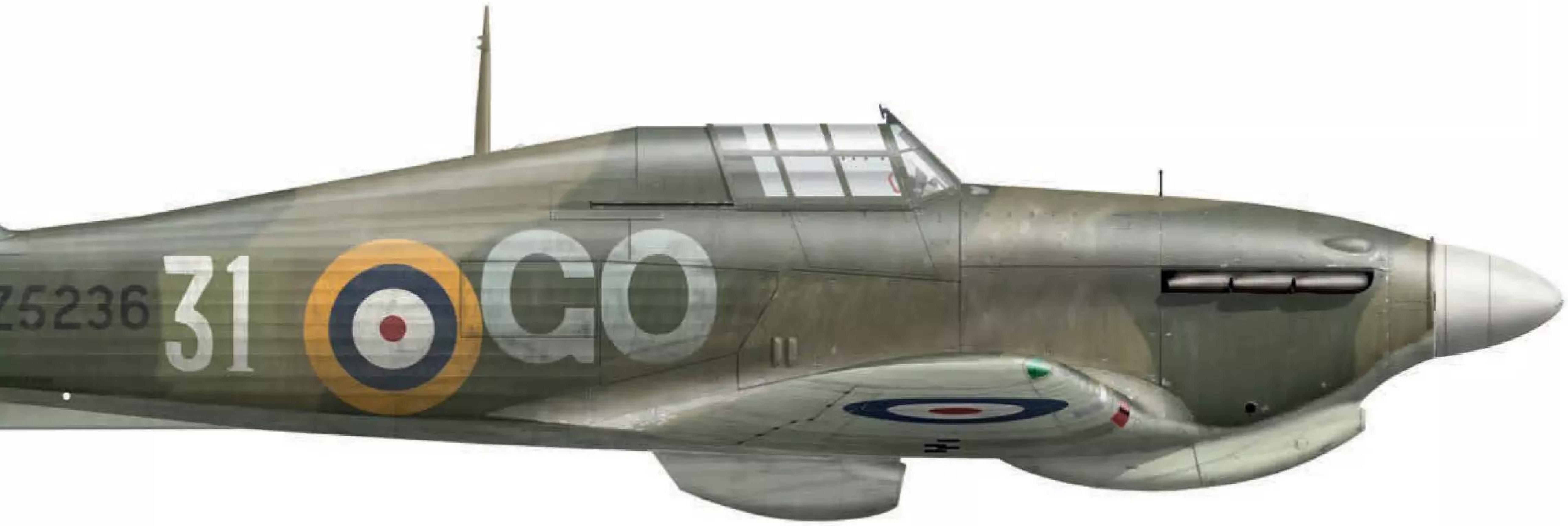
Armament was improved with the addition of yet another four .303 Browning machine guns, for a total of 12. This resulted in another variant – the Mk.IIB. The Mk.IIC had an even more potent armament of four 20mm cannon, with production commencing on January 20, 1941.

The Battle of Britain, between August and October 1940, had seen the air war become one of attrition with Hurricane losses mounting rapidly. Yet by March 1941 Hawker was able to produce 12 Hurricanes every day. And the output of the Kingston, Brooklands, Langley and Hucclecote factories was supplemented by the arrival of 10 Hurricanes a week by ship from Canada.

During August 1941, an initial batch of 39 Mk.IIA Series 2 and Mk.IIB Hurricanes were sent to Russia to help Britain's ally fight off the German invasion, which had begun five months earlier. Shipments continued as the war progressed and a grand total of 2952 Hurricanes were sent – though the number that actually arrived is uncertain since many were lost when the vessels carrying them were sunk. Hurricane deliveries made up the largest part of all aid sent to Russia by Britain.



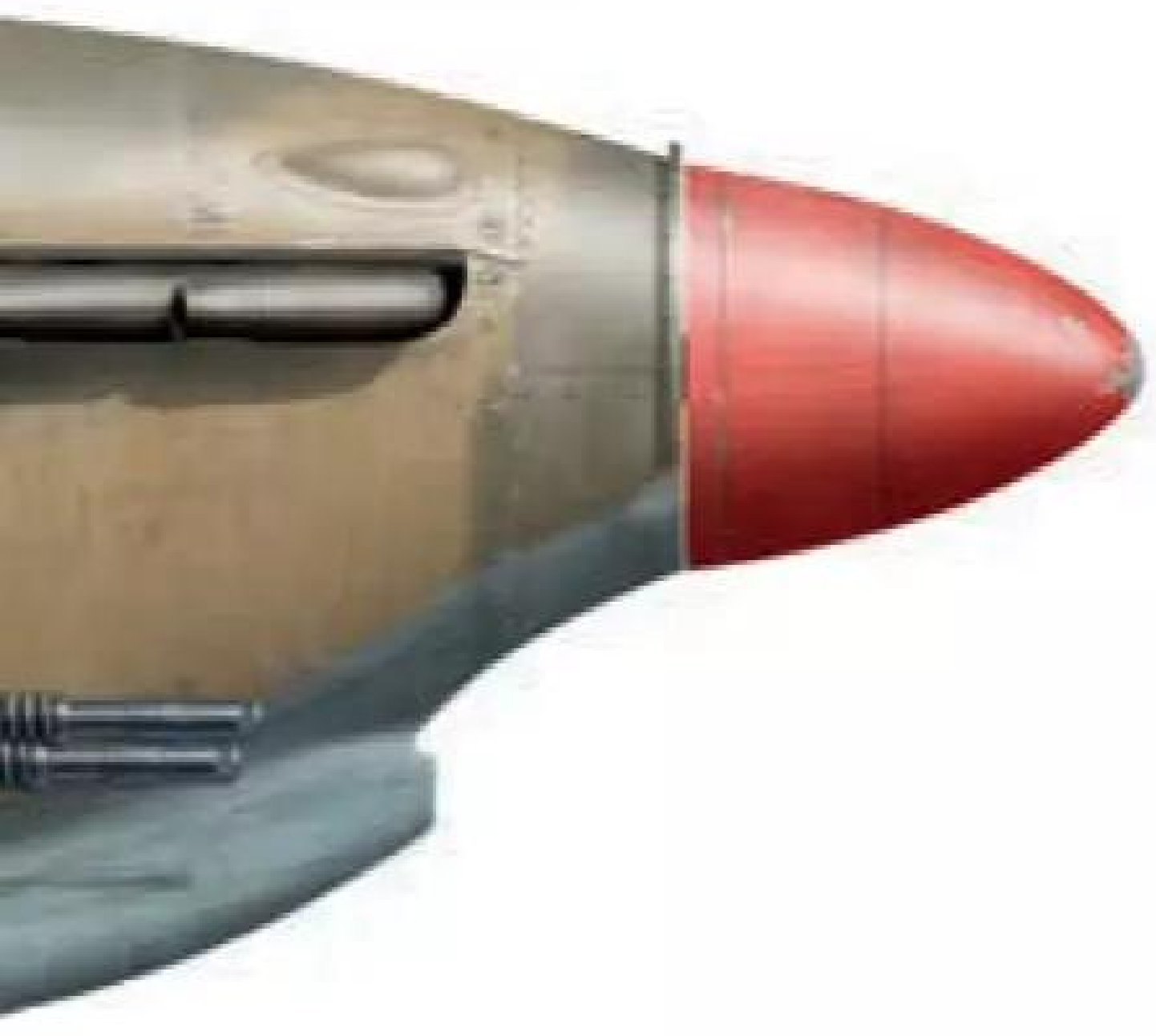




## HAWKER HURRICANE MK.IIB

**Flying Officer John F D 'Tim' Elkington joined 134 Squadron in July 1941 when it was forming up at Leconfield for service in Russia. He flew this aircraft while based in Vayenga, USSR, on September 17, 1941. During the Battle of Britain, Elkington shot down a Messerschmitt Bf 109 on August 15, 1940, only to be shot down and wounded himself the following day by German ace Helmut Wick. He ended the war with that one victory plus two shared and at the time of writing was still alive aged 96.**

BY MARCH 1941, MORE THAN A DOZEN HURRICANES WERE BEING BUILT EVERY DAY

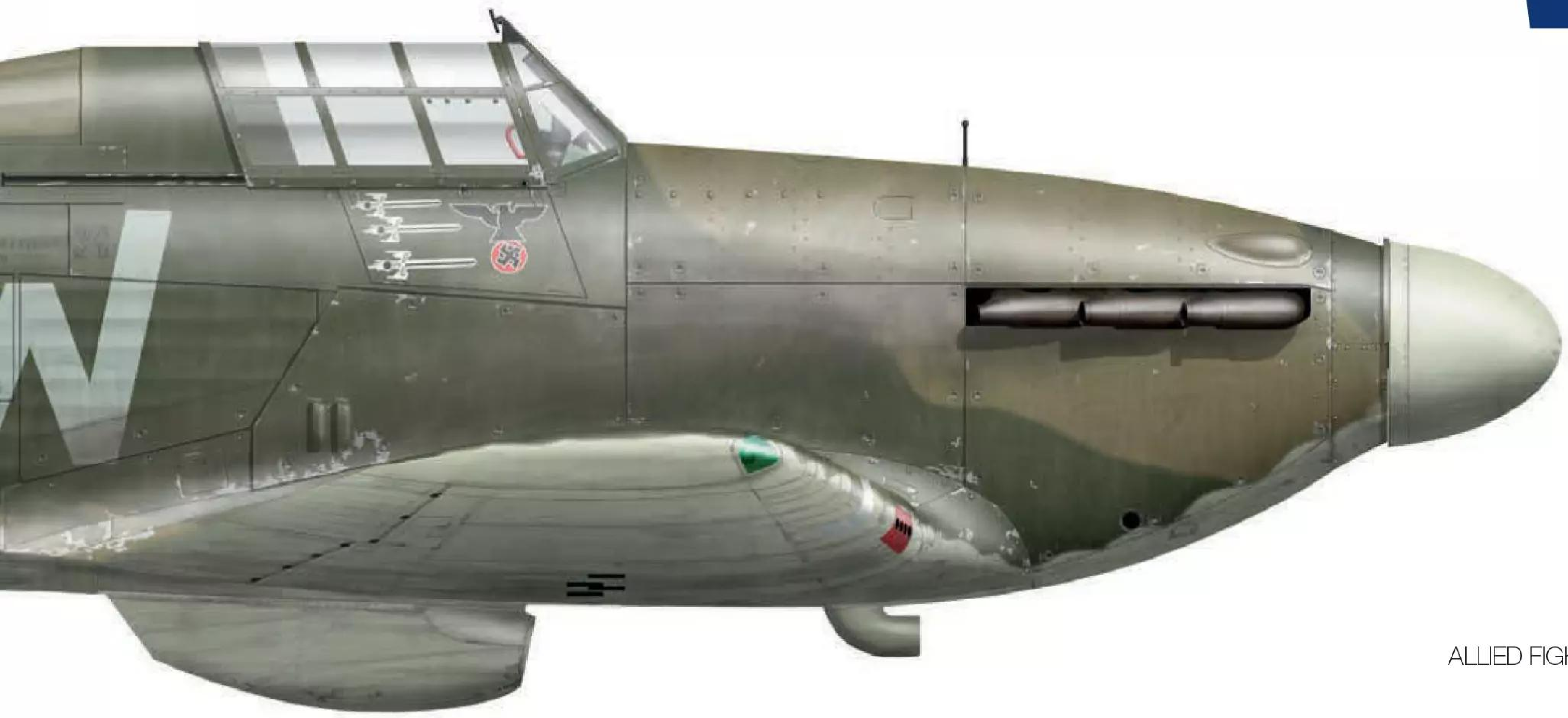


## HAWKER HURRICANE MK.IIC

**Hawker Hurricane Mk.IIC HV505 saw service with 336 (Greek) Squadron, stationed at Sidi Barani in Egypt during May 1943.**

## HAWKER HURRICANE MK.I

**On September 24, 1940, flying Hurricane P3878, Flying Officer Harold Bird-Wilson of 17 Squadron, based at Debden, England, had the dubious distinction of becoming the 40th 'kill' of German ace Adolf Galland of JG 26. He bailed out, landed in the Thames and was picked up by a navy vessel. He went on to serve throughout the war and afterwards, rising to the rank of air vice marshal. Bird-Wilson died in 2000 aged 81.**



Production of an even more powerfully-armed Hurricane, the Mk.IID, commenced in 1942. This had a pair of 40mm cannon in underwing pods plus a pair of wing-mounted Brownings loaded with tracers for aiming purposes. Its primary role was ground-attack against tanks and other armoured fighting vehicles.

A handful of Mk.IIDs were used in Europe, fitted with Rolls-Royce BF cannon, while the majority of them were sent to the Middle East fitted with Vickers 'S' Class cannon. The former had just 12 rounds per gun while the latter had 15.

With a variety of different Hurricane marks now in use, Hawker decided that a universal wing should be produced which could mount a variety of different loads – particularly for ground-attack. This, combined with fitment of a 1620hp Merlin 24/27, became the basis for the new Mk.IV. The Mk.III, which was to have been a Hurricane powered by an American Packard-produced Merlin engine, was never built.

Entering production in 1943, the Mk.IV was built in relatively low numbers – 524 compared to, for example, 4711 Mk.IICs. However, it was the first Hawker aircraft to make widespread use of 3in rockets for ground-attack ahead of their more well-known use with the Typhoon during 1944.

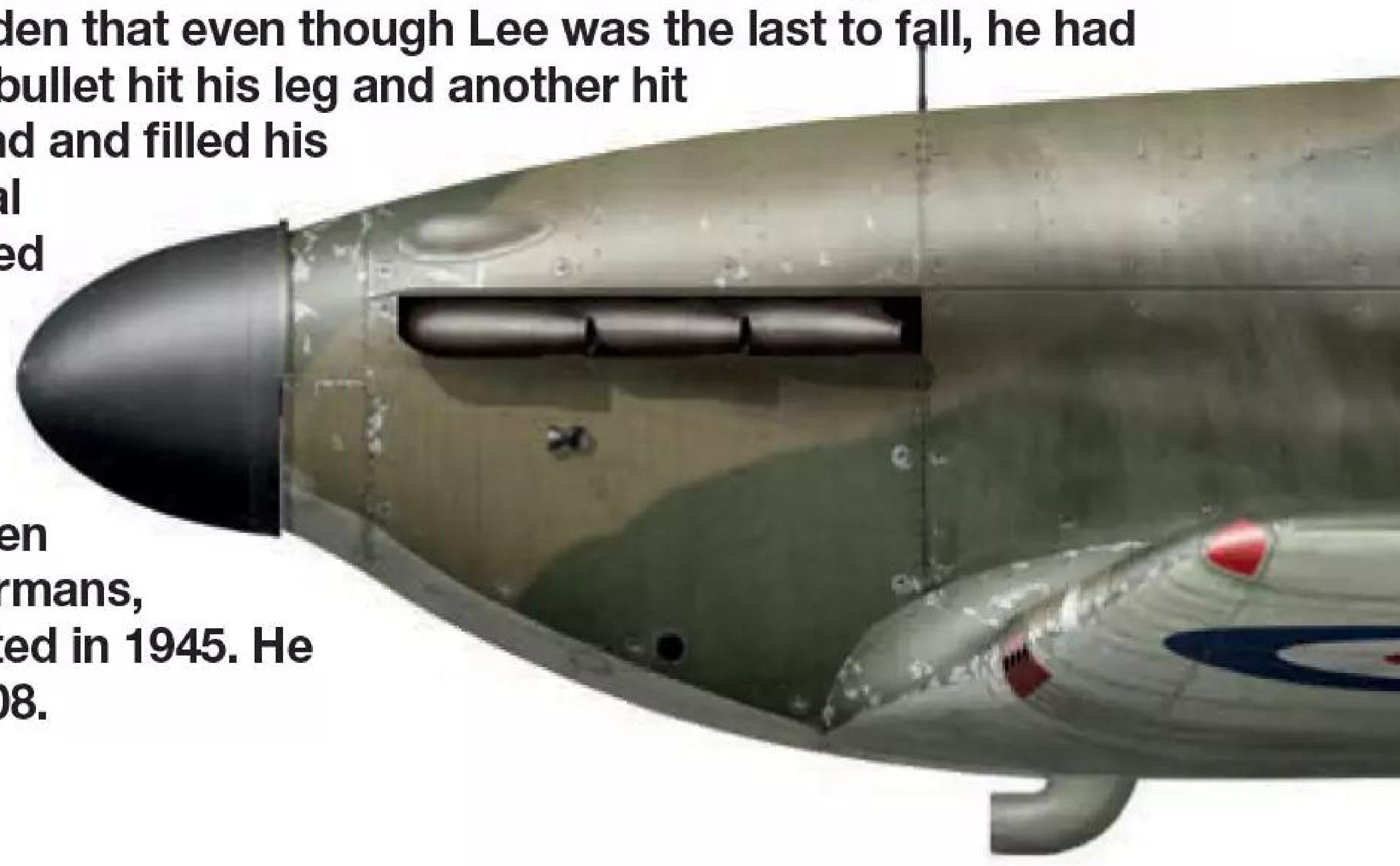
Just two Hurricane Mk.Vs were made. They were essentially Mk.IVs fitted with ground-boosted Merlin 32 engines and four-bladed Rotol propellers. Thorough trials determined that there was no real advantage to this configuration and both Mk.Vs – KZ193 and NL255 – were returned to their original Mk.IV form.

The other major variant of the type was the Sea Hurricane. During the campaign in 1940 Norway campaign, Hurricanes of 46 Squadron had been flown from HMS Glorious – a First World War battlecruiser converted into

THE CANNON-ARMED HURRICANE MK.IID'S MAIN ROLE WAS GROUND-ATTACK

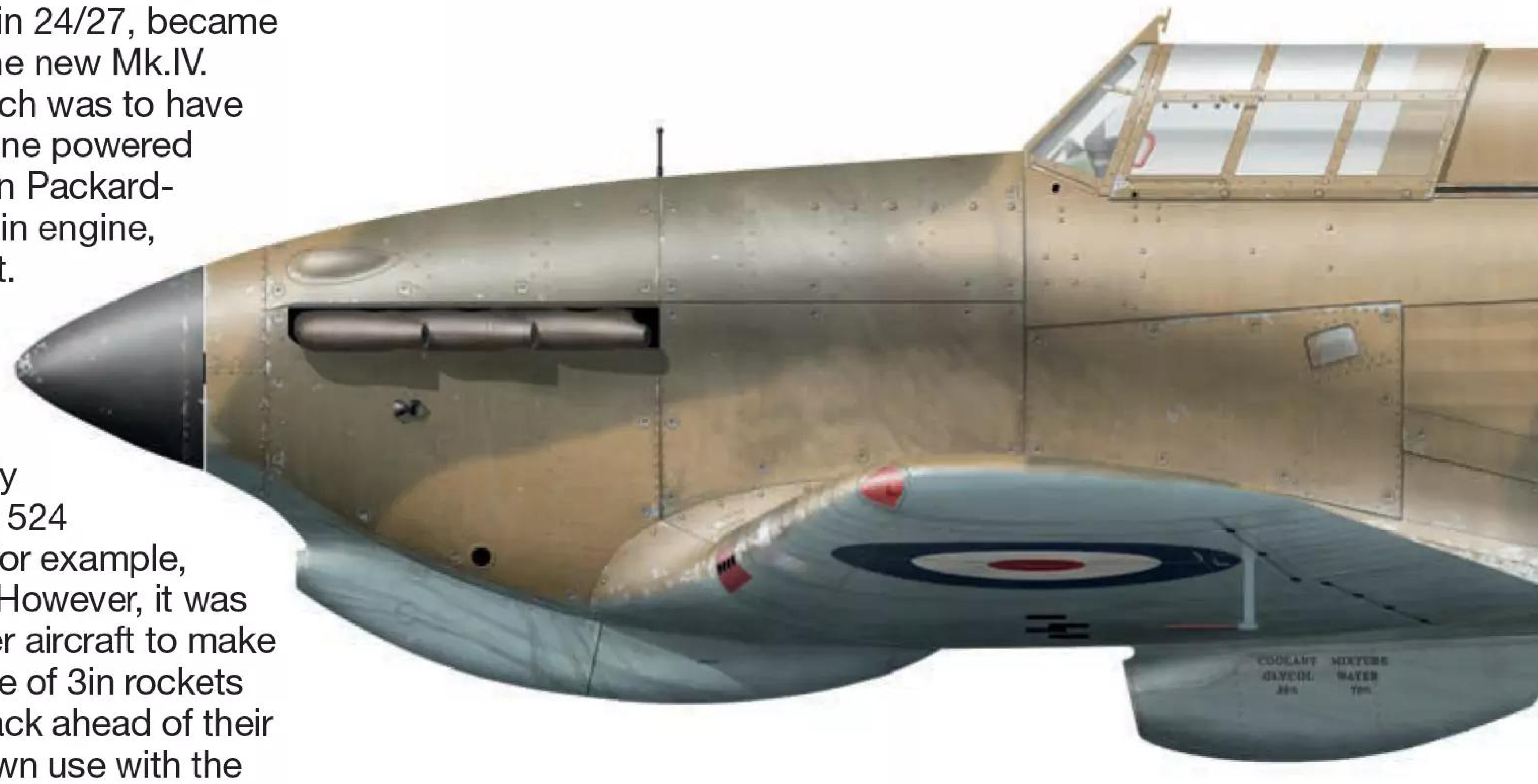
## HAWKER HURRICANE MK.I

**P3059 was flown by Pilot Officer Kenneth 'Hawkeye' Lee, 501 Squadron, based at Hawkinge, England, on August 18, 1940. He was on a patrol at 17,000ft over Canterbury when Luftwaffe ace Oberleutnant Gerhard Schöpfel shot down his machine and three others in a single pass. The attack was so sudden that even though Lee was the last to fall, he had no warning until a bullet hit his leg and another hit his seat from behind and filled his shoulder with metal fragments. He bailed out and survived, continuing to fly and fight until he was shot down over Crete and taken prisoner by the Germans, finally being liberated in 1945. He died aged 92 in 2008.**



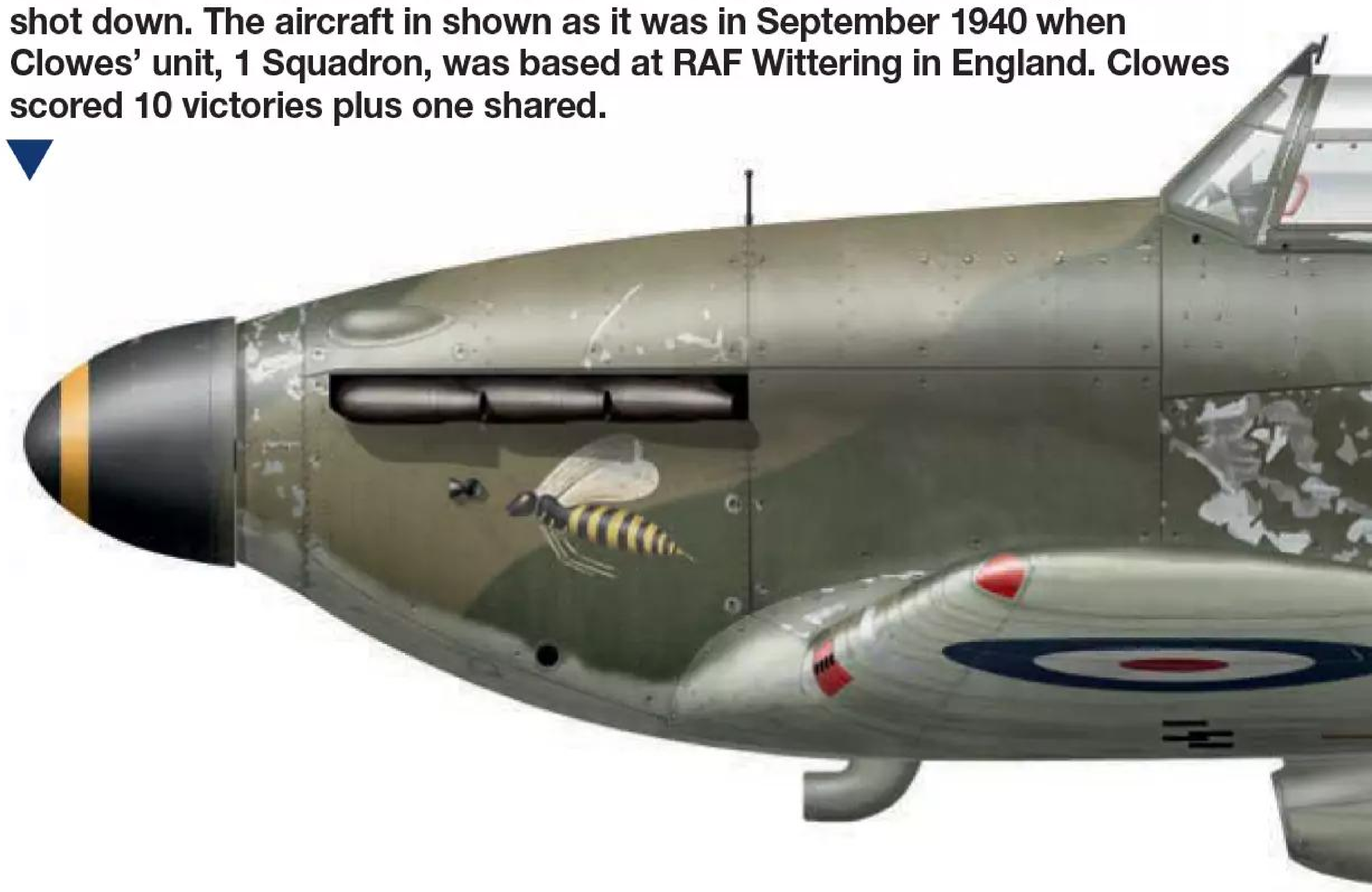
## HAWKER HURRICANE MK.I

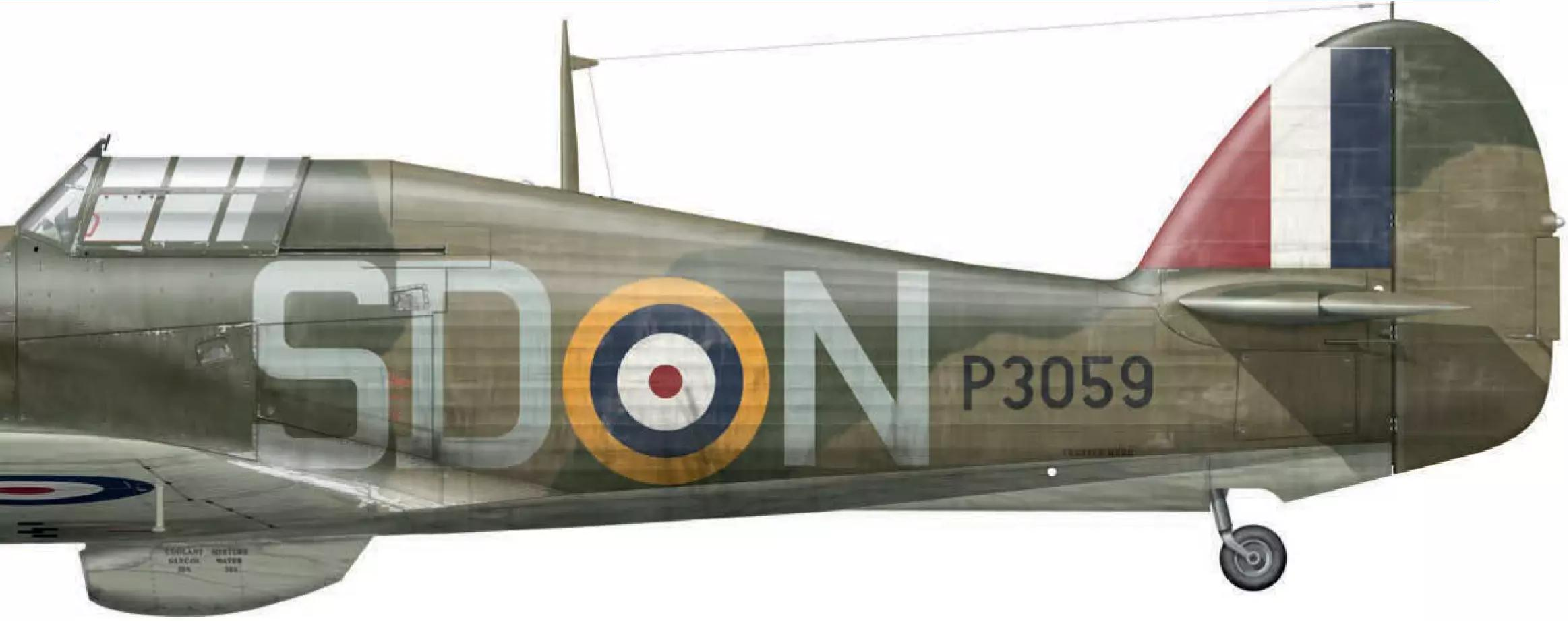
**Flying Officer Roger 'Jock' Hilton-Barber of 261 Squadron, stationed at Hal Far on Malta, had been flying Gloster Gladiators until his unit received tropicalized Hurricanes in August 1940. Even then, most of Hilton-Barber's missions for the rest of the year were flown in Gladiators.**



## HAWKER HURRICANE MK.I

**The wasp emblem on the nose of Pilot Officer Arthur Victor 'Taffy' Clowes was intended to record his victories – one stripe for each enemy aircraft shot down. The aircraft in shown as it was in September 1940 when Clowes' unit, 1 Squadron, was based at RAF Wittering in England. Clowes scored 10 victories plus one shared.**

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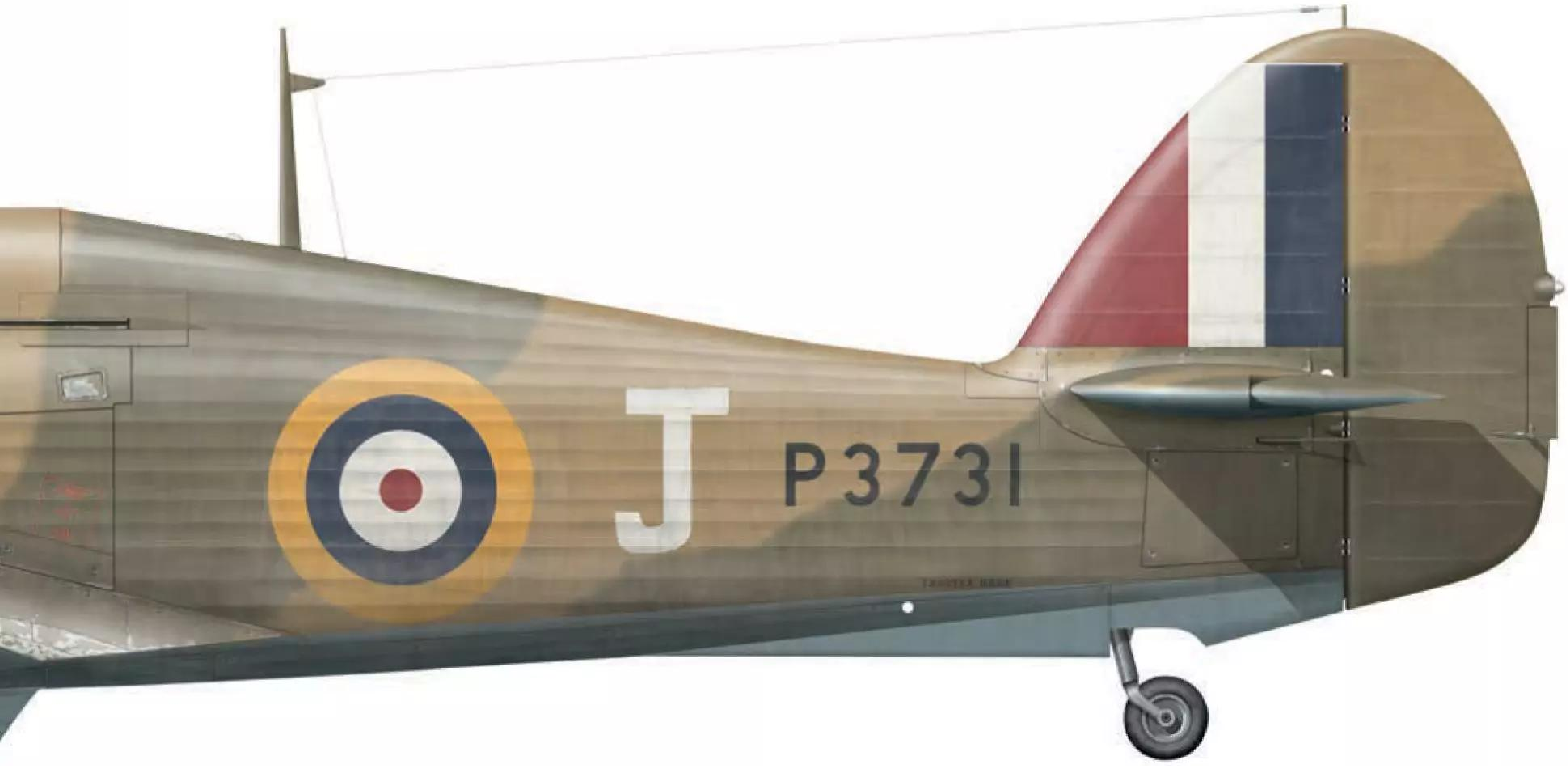
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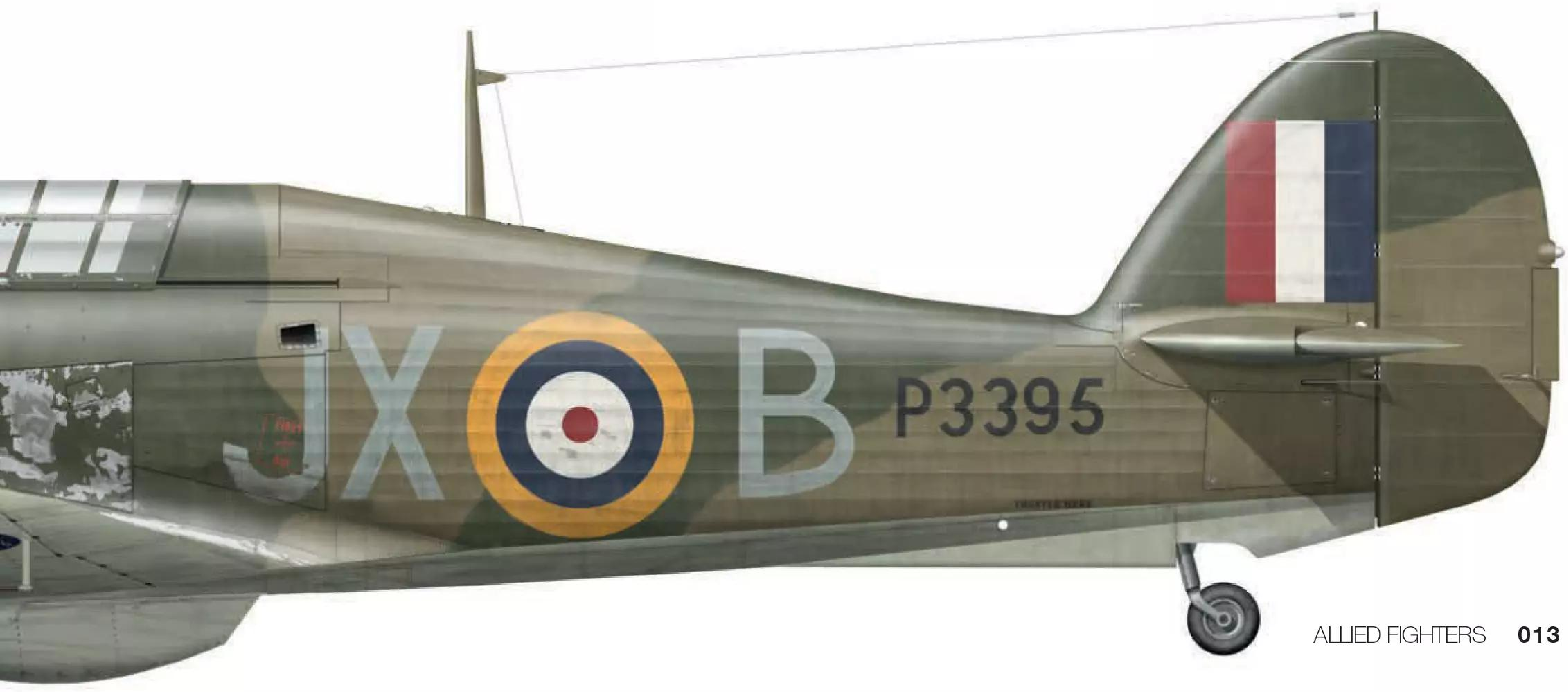
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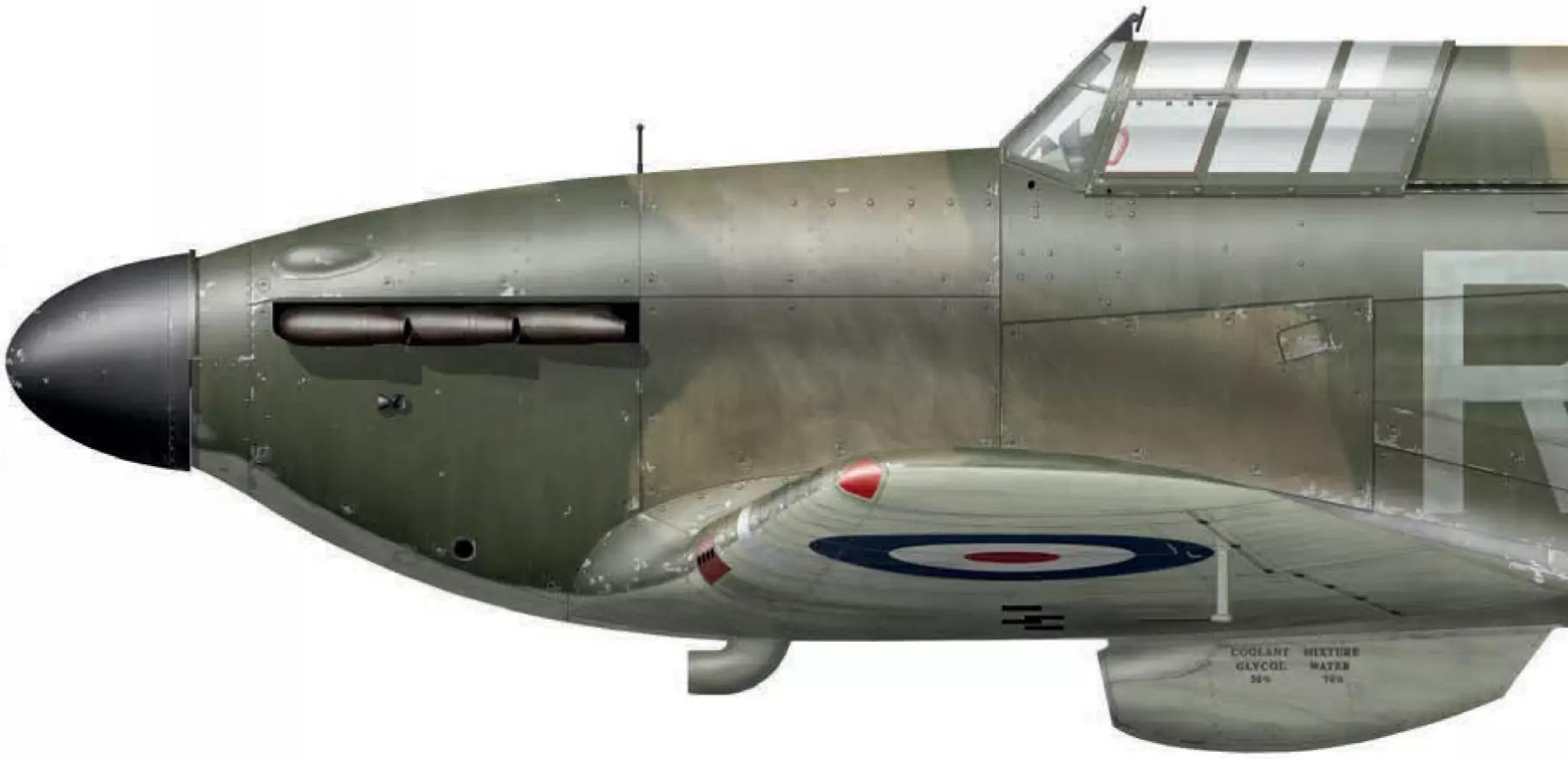
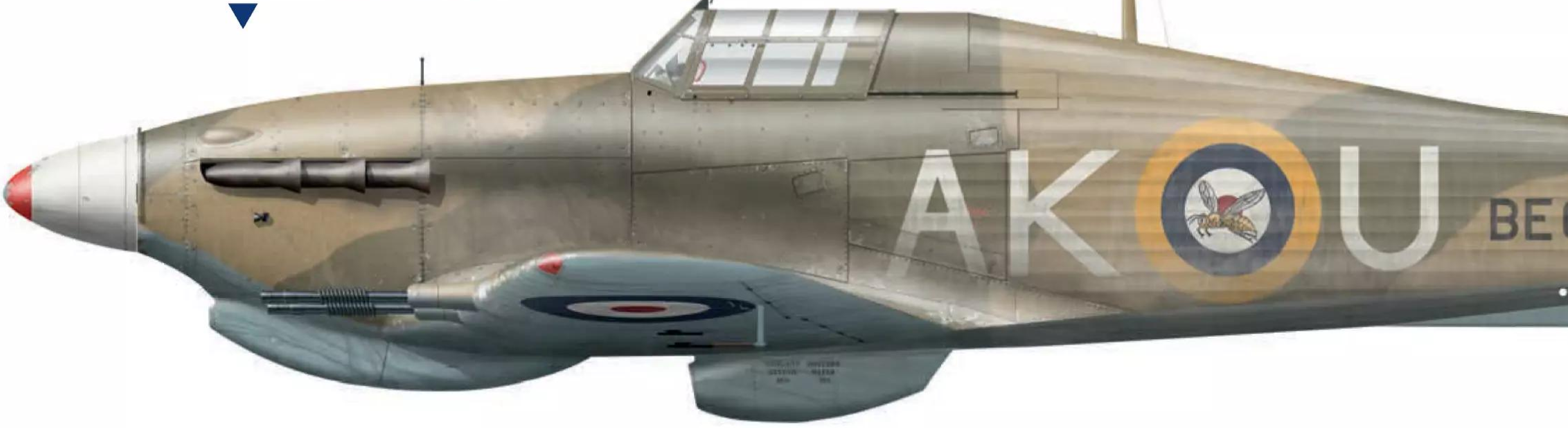
THE LAST HURRICANE WAS MADE IN JULY 1944



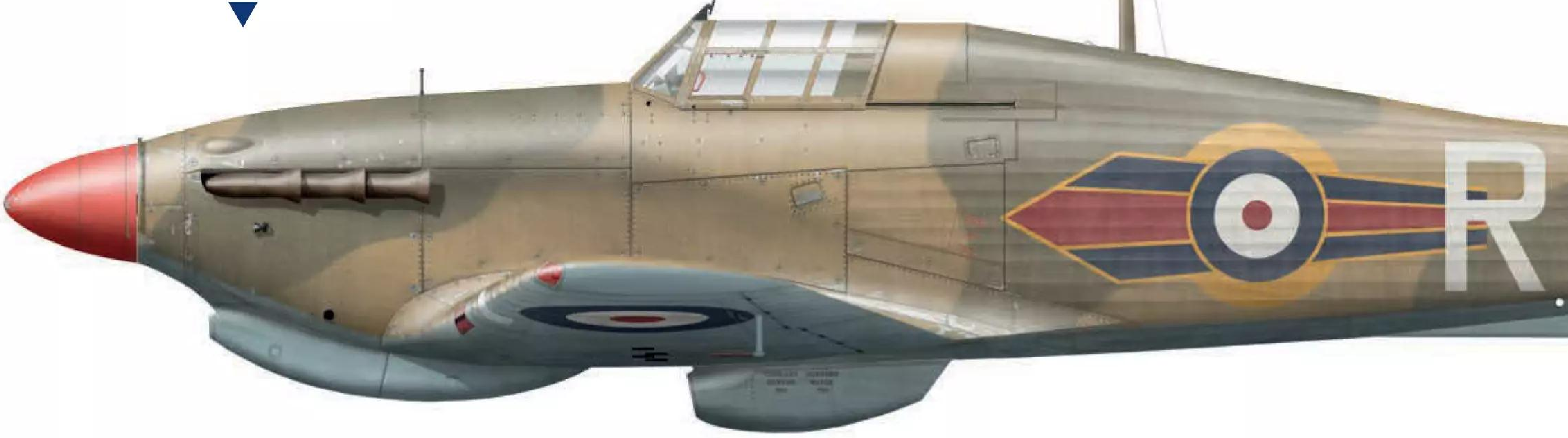
## HAWKER HURRICANE MK.IIC

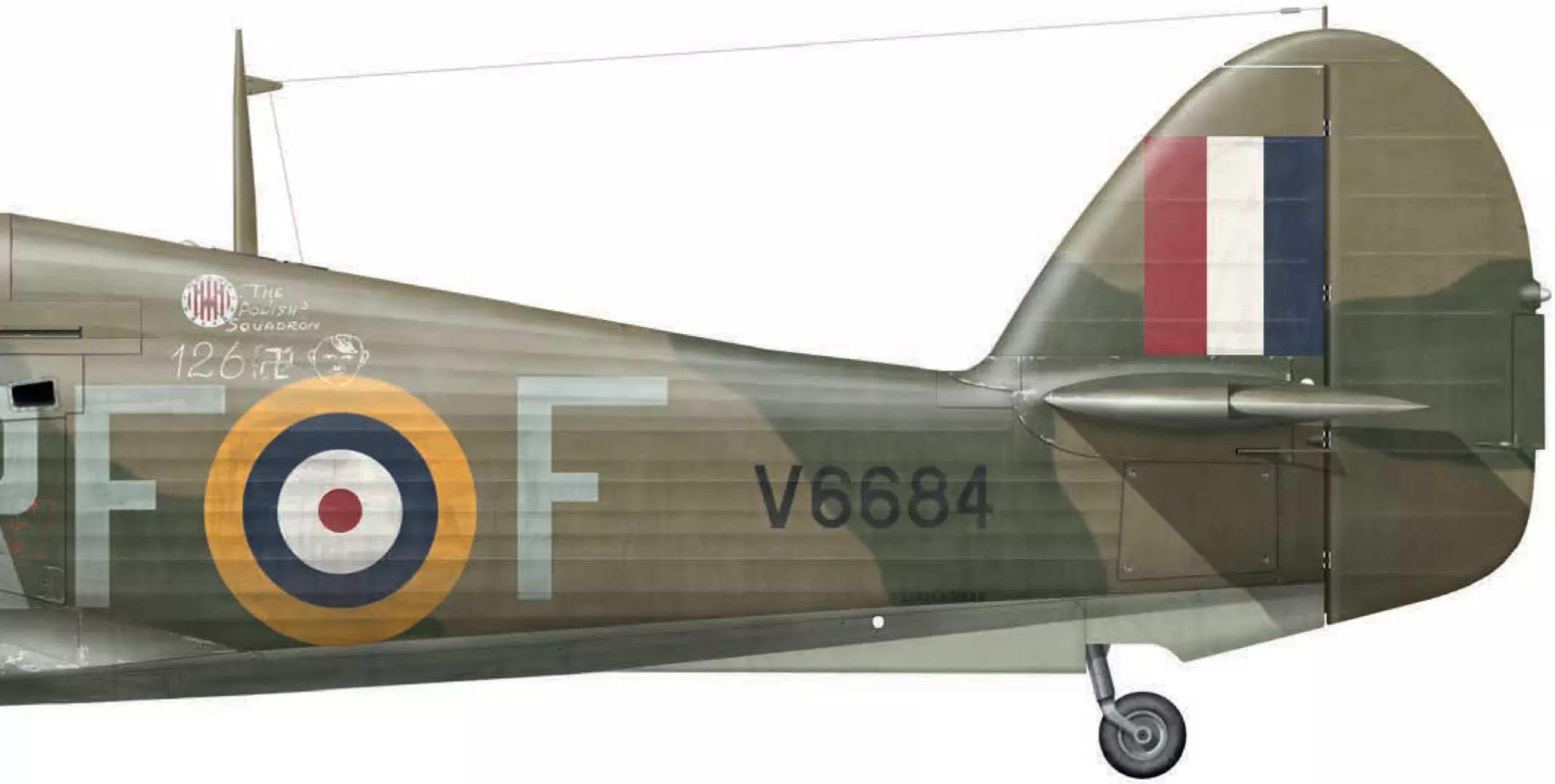
Canadian Pilot Officer Albert U ‘Bert’ Houle Jr, who had previously been a boxer and wrestling champion, and worked as a miner, enlisted in 1940 before training as a pilot and eventually being stationed at Edku, Egypt, with 213 Squadron, during the spring of 1942. He ended the war with three victories plus one shared and died in 2008.



## HAWKER HURRICANE MK.IIB

The distinctively marked BD930 as it looked when serving with 73 Squadron, based in Gambut Main, Libya, during Apil 1942.





## HAWKER HURRICANE MK.I ▲

**Polish ace Squadron Leader Witold Urbanowicz flew with 303 (Polish) Squadron, based at Northolt, England, during September 1940. On the 27th, he shot down four enemy aircraft – two Ju 88s, a Bf 109 and a Bf 110. Three days later, he shot down another three Bf 109s and a Do 17. He achieved 18 victories overall plus three shared. During the war none of the aircraft he flew was ever hit by an enemy bullet and he died in 1996 aged 88.**

an aircraft carrier – and it was decided that the fighter would be suitable for operations defending Allied shipping.

Early Sea Hurricanes were created by modifying existing Mk.Is with catapult gear. The first example also featured an arrester hook but this was deleted from the remainder of the initial batch of 50, known as Sea Hurricane Mk.IAs. Rather than being launched from aircraft carriers, single Sea Hurricanes were to be launched individually from catapults fitted to merchant vessels.

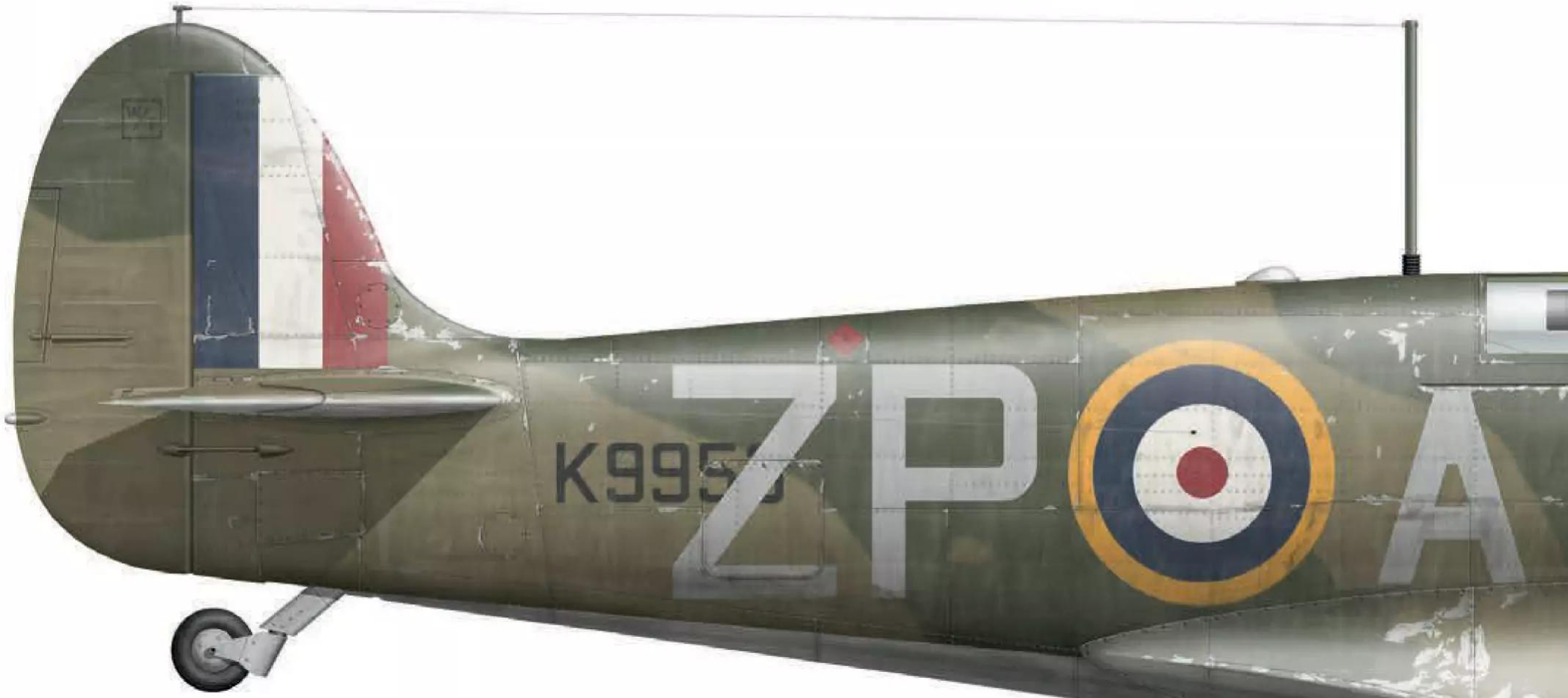
These ships did not possess any means of recovering their Hurricane, once it had been launched, so the pilot was usually required to either bale out or ditch their machine in the sea and hope for rescue.

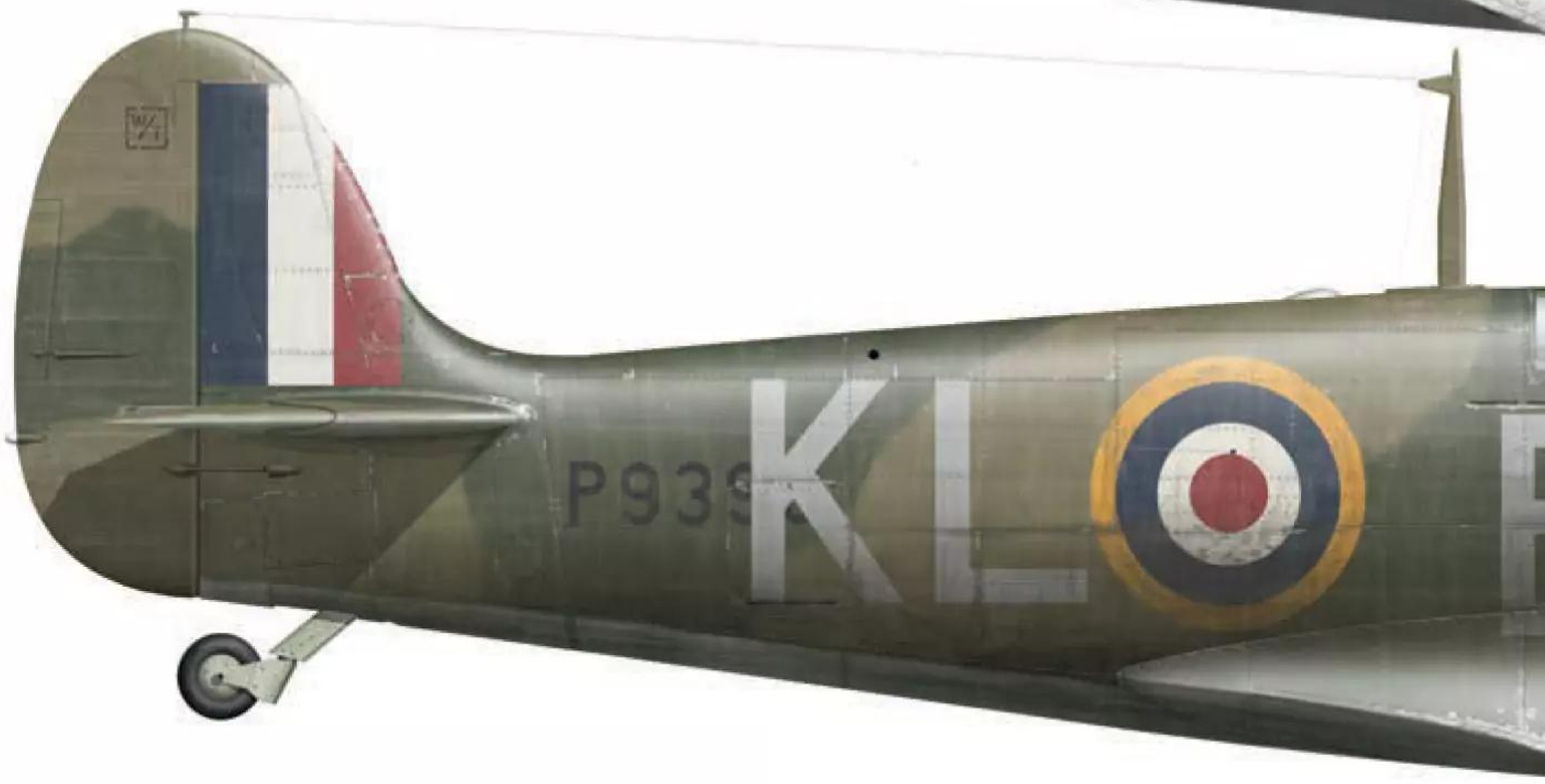
The success of these aircraft in shooting down Focke-Wulf Fw 200 Condor long-range maritime patrol aircraft – five by the end of 1941 – resulted in an order being placed for another 300. These were again converted from existing Mk.Is but this time with arrestor hooks fitted, making them Sea Hurricane Mk.IBs. Twenty-five Mk.IIA Series 2s were also converted, also becoming Sea Hurricane Mk.IBs.

Rather than being launched from single one-shot catapults, the hooked aircraft were embarked upon converted merchantmen known as MAC-ships which had short flight decks fitted. These too enjoyed considerable success, paving the way for the Sea Hurricane Mk.IC, which was converted from the Hurricane IIC. The final Sea Hurricane was the Mk.IIC, a variant fitted with both an arrester hook and a naval radio. A limited number of Canadian-built Hurricane XIIAs were also converted to Sea Hurricane configuration.

Overall, 14,533 Hurricanes had been built by the end of July 1944, when production finally ceased with PZ865, a Mark IIC known as 'The Last of the Many'. This aircraft was bought by Hawkers and kept in storage at Langley. Today it continues to fly with the Battle of Britain Memorial Flight in Lincolnshire.

# SUPERMARINE





Note: Only the main wartime land-based fighter versions of the Spitfire are covered in this account.

1935-1944

**The iconic Supermarine Spitfire became a symbol of British resistance in the face of the Luftwaffe onslaught during the Battle of Britain. The subject of continual evolution and enhancement, it remained at the forefront of the action throughout the war.**

Having previously concentrated almost entirely on flying boats and seaplanes, Supermarine's chief designer R J Mitchell first began to consider working on land-based fighter aircraft in February 1931. The Air Ministry had been discussing the specification for a new single-seat night and day fighter since 1929 but had yet to release a formal set of requirements.

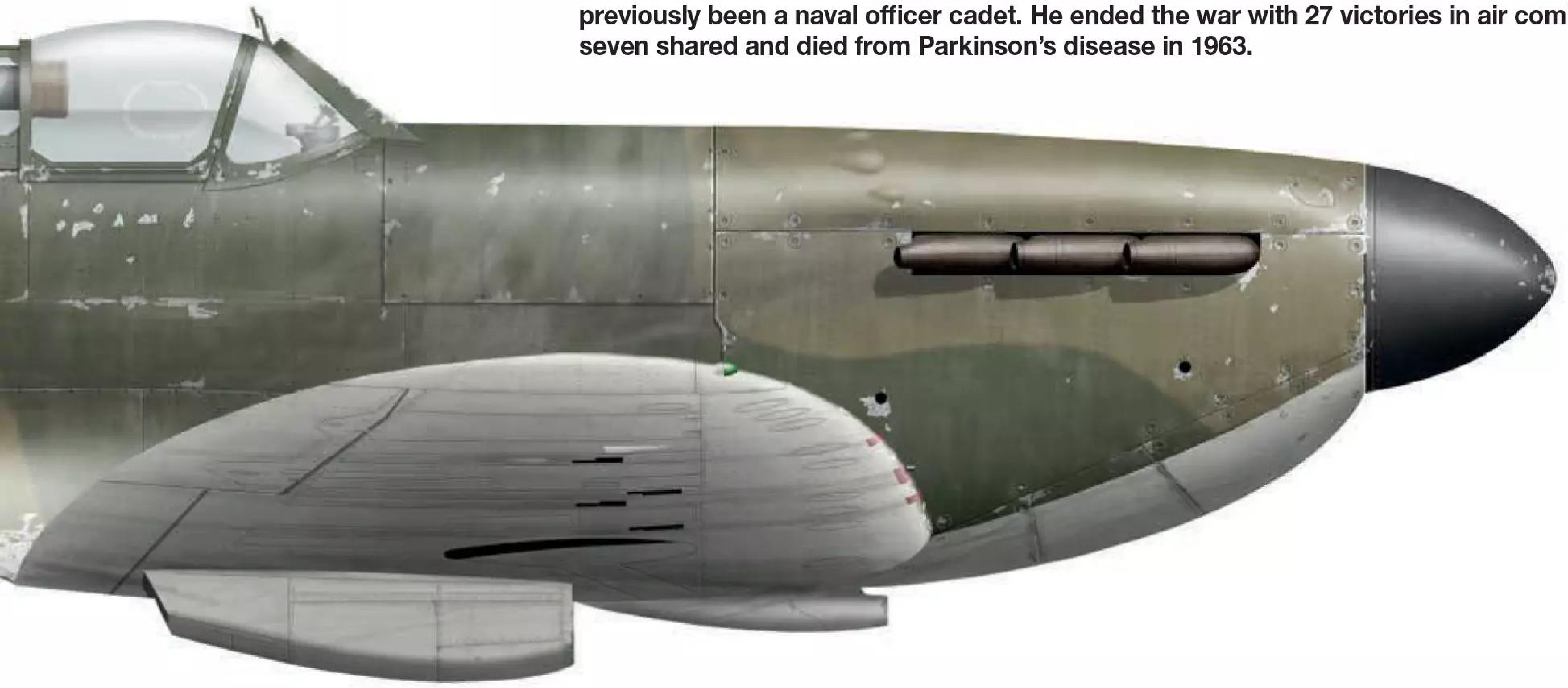
Drawing on the company's experience with building metal wings and stressed skin structures for its Schneider Cup racers, Mitchell prepared two designs under the designation Type 178 – one a biplane and the other a monoplane. Apart from their wing layout, they had many features in common, such as a fixed undercarriage and the use of a Rolls-Royce Kestrel 'S' engine.

Finally, Specification F.7/30 for a single-seat fighter was issued in October 1931 and Mitchell submitted the monoplane to meet it in February 1932 while development work continued, with the design being redesignated Type 224.

# SPITFIRE

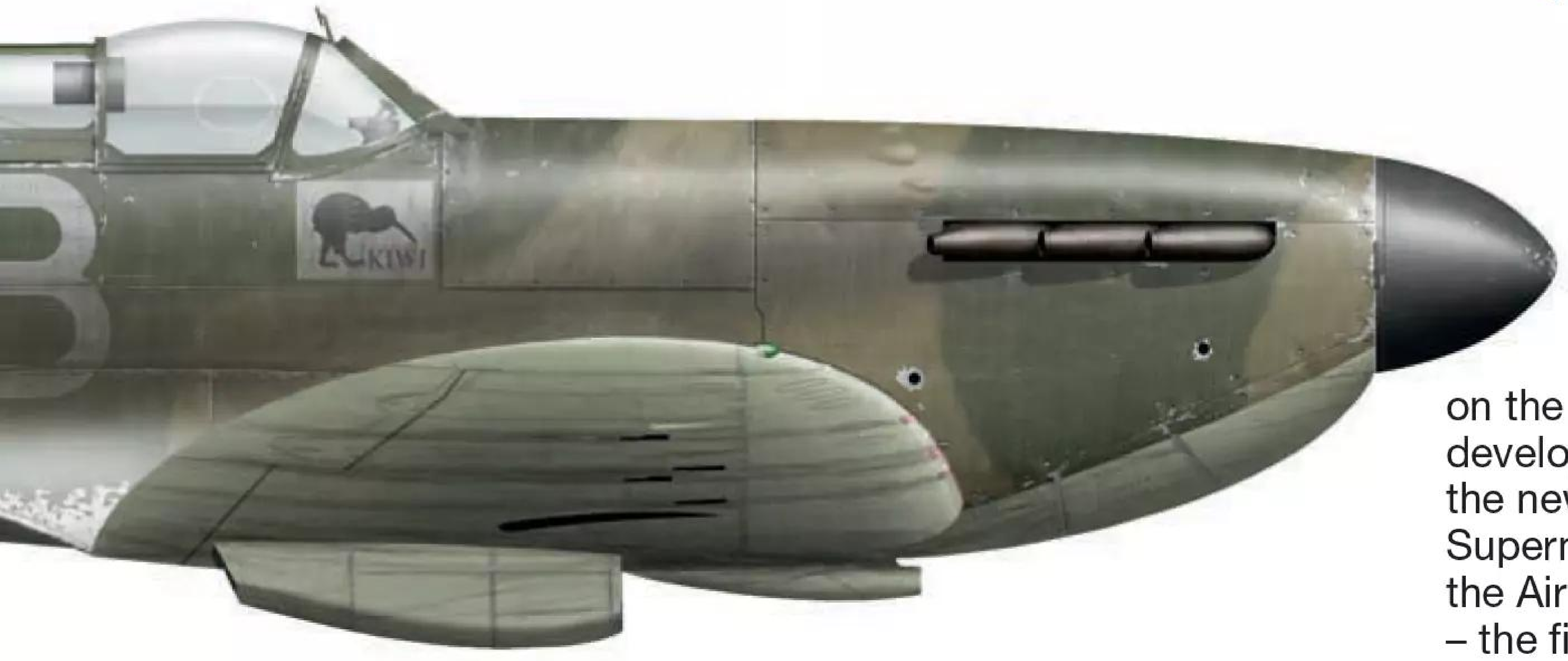
## SUPERMARINE SPITFIRE MK.IA ▼

**At the height of the Battle of Britain, 74 Squadron was led by Adolph Gysbert 'Sailor' Malan. During the fierce fighting over Dunkirk in June 1940 he flew with Spitfire Mk.I while stationed at Hornchurch, England. A South African, Malan was nicknamed 'sailor' for having previously been a naval officer cadet. He ended the war with 27 victories in air combat plus seven shared and died from Parkinson's disease in 1963.**



## ◀ SUPERMARINE SPITFIRE MK.IA

**Flight Lieutenant Alan C Deere of 54 Squadron, stationed at Hornchurch, England, shot down a Bf 109 while flying this aircraft on August 11, 1940. He shot down two more, plus a Bf 110, the following day. Deere survived the war with 17 victories in air combat plus one shared and died in 1995 aged 77.**



A contract was awarded for a prototype in August and after much redrafting and many alterations the aircraft was completed, except for its engine, in November 1933. Rolls-Royce finally managed to supply an example of what was now known as the Goshawk on December 8 and it was duly installed, the work not being finished until February 10, 1934, due to the aircraft's complicated evaporative cooling system.

The Type 224's first flight took place on February 19. It had an inverted gullwing arrangement, a fixed undercarriage and an open cockpit. Its performance, though not poor, was still a disappointment, particularly given the years of work that had already been put into it. The cooling system failed to operate as expected and the engine suffered from overheating

Eventually the F.7/30 competition was won by the Gloucester Gladiator but Supermarine did not give up on the Type 224. Instead, its development continued under the new designation Type 300. Supermarine offered this to the Air Ministry as two options – the first an upgrade of the existing Type 224 prototype, the second incorporating the same features but as part of an entirely new design.

Type 300 replaced the inverted gullwings with conventional straight ones housing machine guns. It also had a retractable undercarriage and featured a fully enclosed cockpit. By mid-1934 the Type 300 was being worked on outside the usual specification structure as an experimental aircraft. The Air Ministry asked for a cost estimate to build it as

THE SUPERMARINE TYPE 300 FORMALLY BECAME THE SPITFIRE DURING THE SUMMER Of 1936

a prototype in September 1934. By this point the cockpit had been lowered and aerodynamically shaped wing fillets had been added, the wings themselves becoming thinner and more elliptical in shape. The undercarriage had been further modified too, and the type now carried four Vickers .303in machine guns – two in each wing outboard of the propeller.

A new specification, F.37/34, was drafted specifically for the Type 300 and on January 3, 1935, Supermarine received a contract to build a prototype. It would be powered by a new Rolls-Royce engine, the PV-12, rather than the Goshawk, which had proven to be unreliable. A new Air Staff Requirement for an eight-gun fighter, F.10/35, was issued in April 1935 but withdrawn when it became clear that both the Supermarine design and another being developed by Hawker could meet its specification.

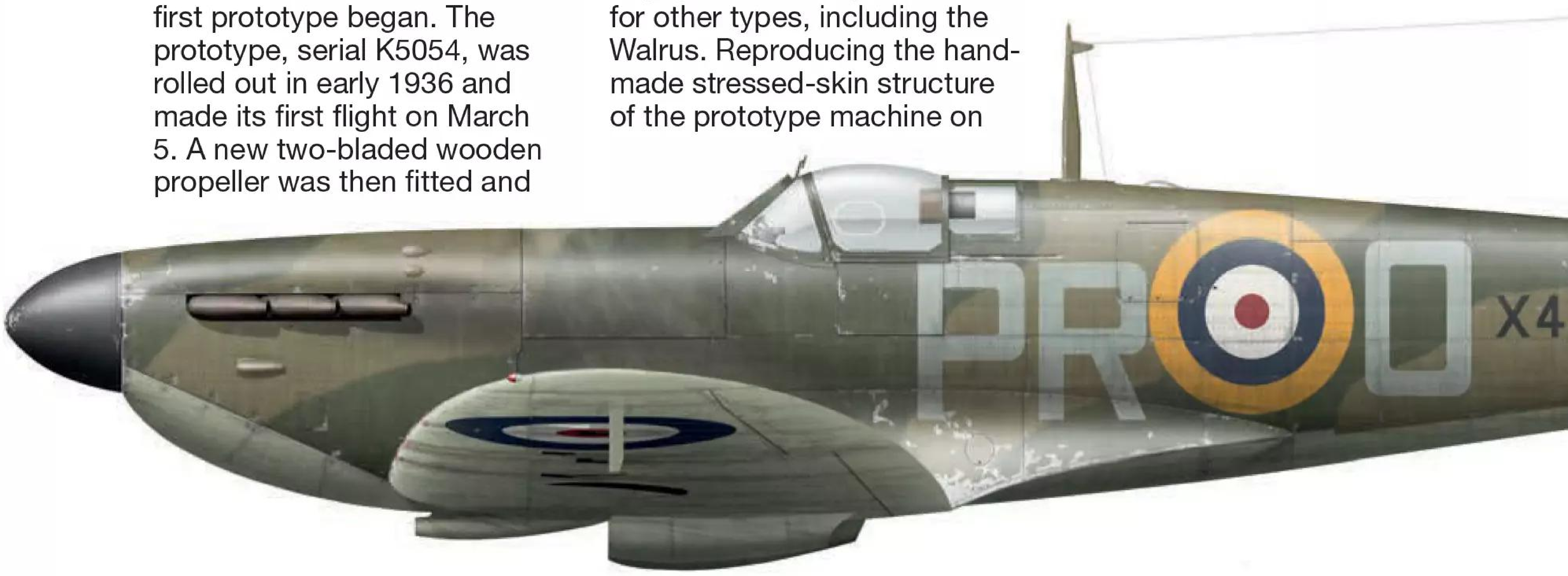
The Type 300's armament was changed to eight Browning .303s, four in each wing and detail design and construction of the first prototype began. The prototype, serial K5054, was rolled out in early 1936 and made its first flight on March 5. A new two-bladed wooden propeller was then fitted and the aircraft flew again on March 10. Tests revealed that the aircraft could reach a top speed of 330mph but this was improved to 348mph with the addition of another new propeller in May 1936.

Reports from pilots were universally positive, with only minor requests for alterations – such as the addition of an undercarriage position indicator. The Air Ministry therefore placed an order for 310 production models on June 3, 1936. It was around this time that the name 'Spitfire' was formally applied.

Work on setting up production lines for the Spitfire progressed more slowly than expected, primarily because Supermarine was a relatively small company with only 500 employees – and was already engaged in fulfilling orders for other types, including the Walrus. Reproducing the hand-made stressed-skin structure of the prototype machine on

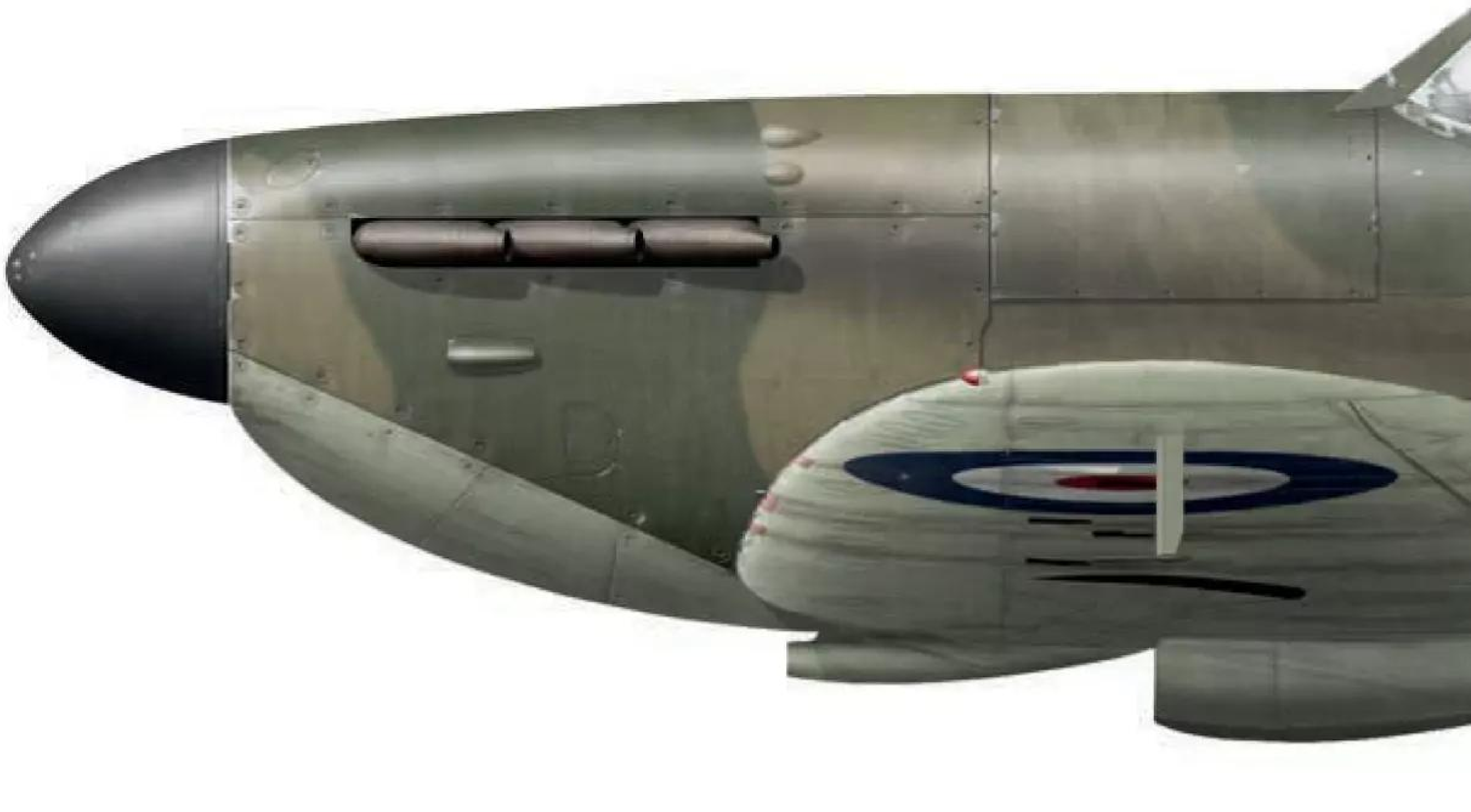
### SUPERMARINE SPITFIRE MK.IA ▼

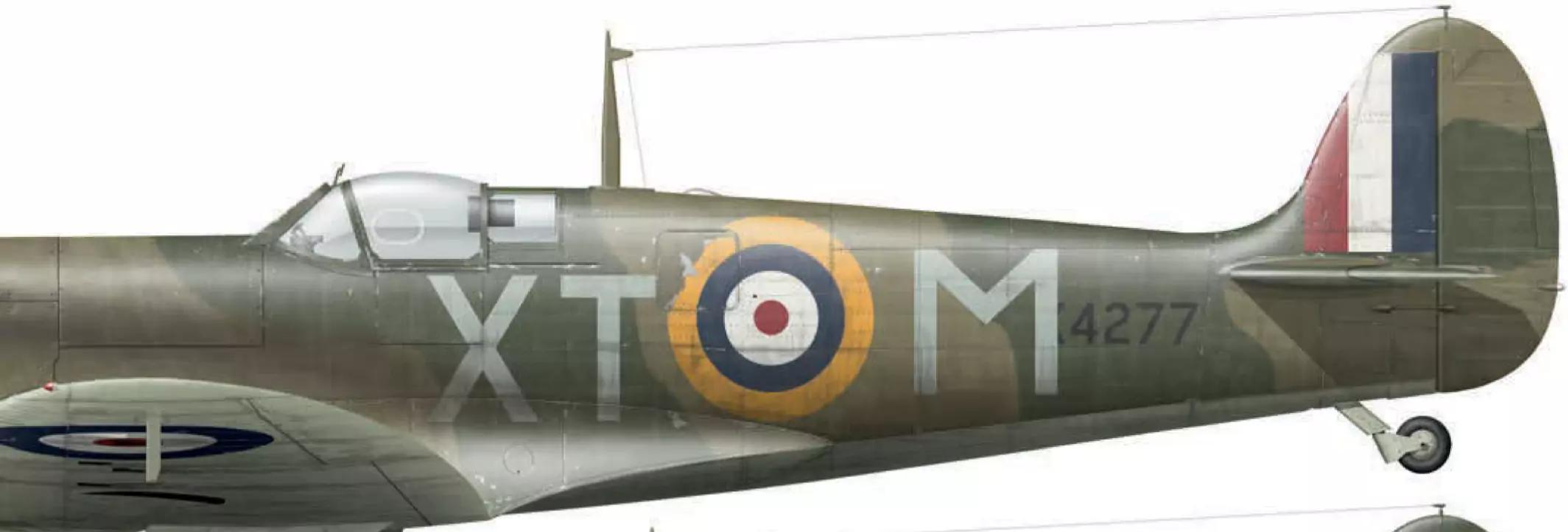
**On September 3, 1940, having just achieved his fifth aerial victory, becoming an 'ace', Pilot Officer Richard H Hillary of 603 Squadron, stationed at Hornchurch, England, was shot down himself. He struggled to get the canopy of his crippled Spitfire open and suffered extensive burns to his face and hands. Having undergone extensive plastic surgery and still suffering from his injuries, he returned to active service but was killed when his Bristol Blenheim crashed during a night flight on January 8, 1943. He was 23.**

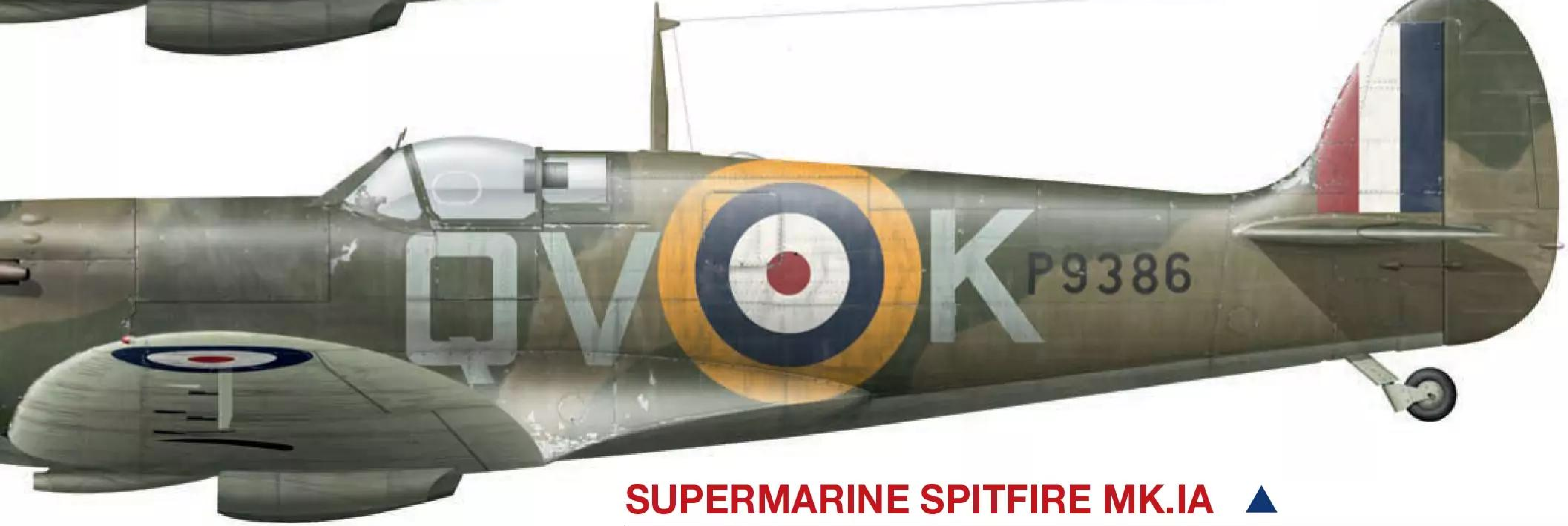


### SUPERMARINE SPITFIRE MK.IA ▶

**This aircraft was flown by Flying Officer John Colin Mungo-Park, 74 Squadron, Hornchurch, England, on October 29, 1940. Mungo-Park was flying a Spitfire VB when he was shot down near Dunkirk on June 27, 1941, aged 23. In all he had claimed 11 aircraft destroyed and two shared, five probables, and four damaged enemy aircraft.**





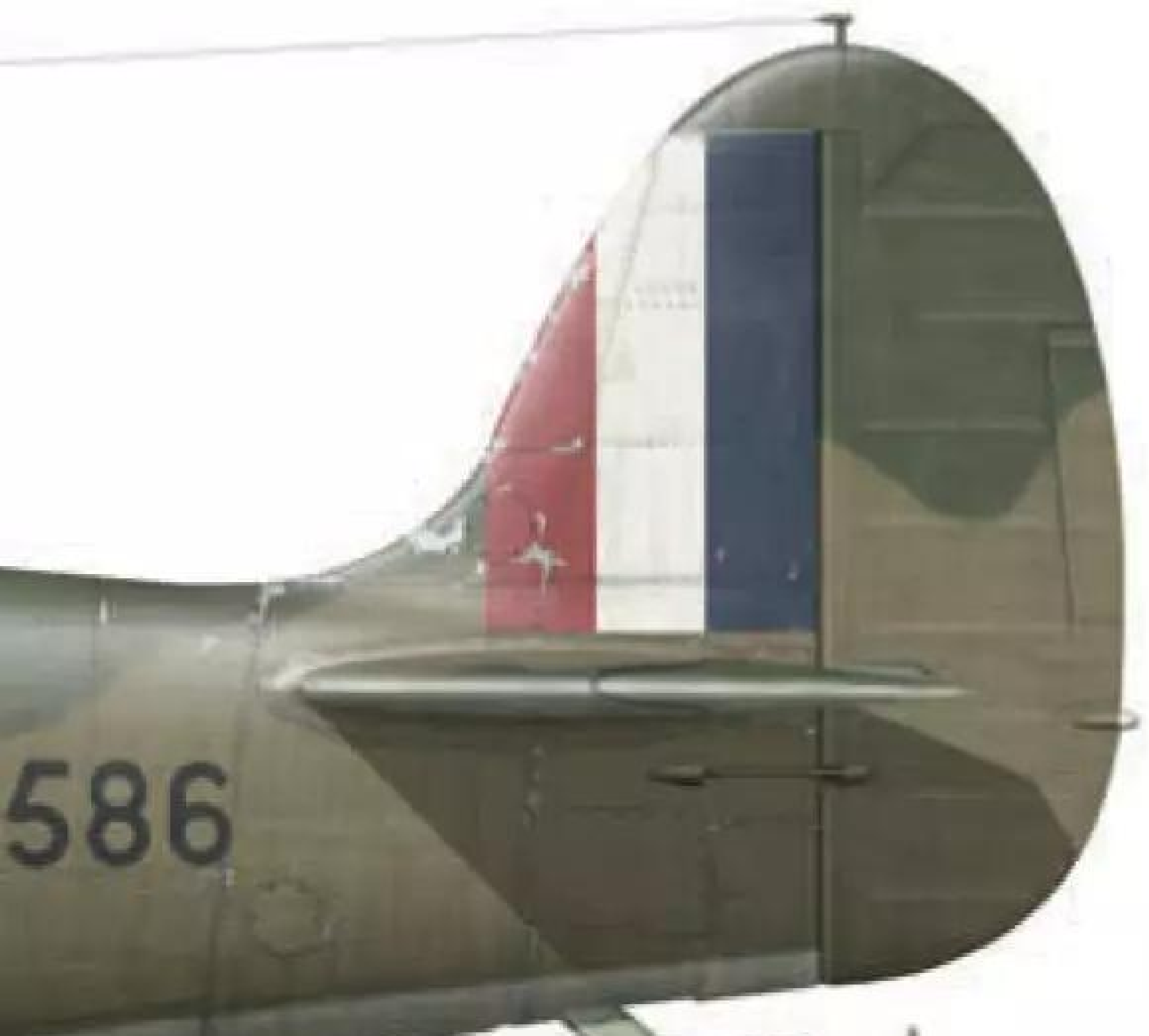


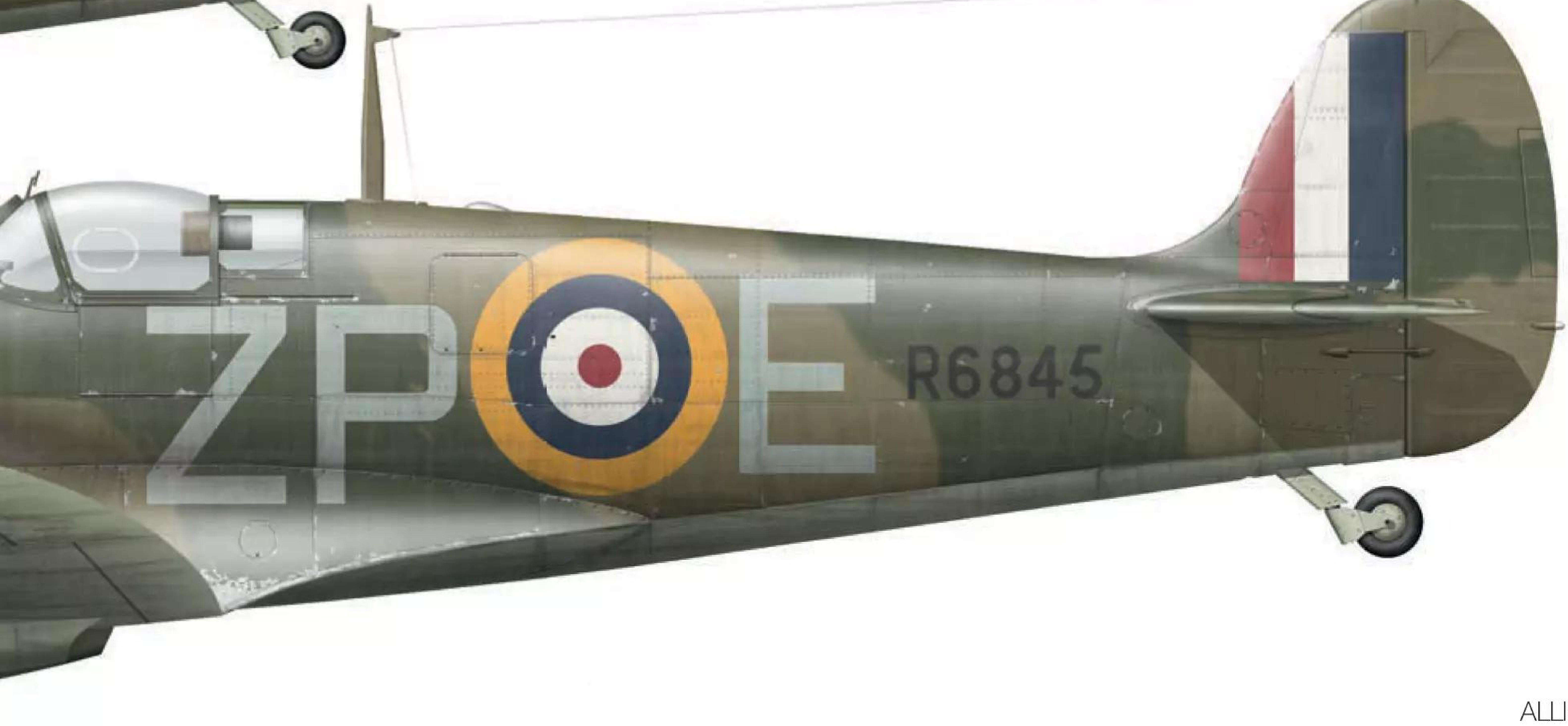
## SUPERMARINE SPITFIRE MK.IA ▲

This Spitfire was being flown by Brian 'Sandy' Lane of 19 Squadron, based at Fowlmere, England, during September 1940, around the time of his promotion to squadron leader. He went missing on December 13, 1942, after being last seen chasing a pair of Fw 190s over the North Sea. He never returned and has never been found. At the time of his disappearance, aged 25, he had achieved six victories in air combat plus one shared.

## SUPERMARINE SPITFIRE MK.IA ◄

Pilot Officer John C Dundas of 609 Squadron, stationed at Middle Wallop, England, shot down the Luftwaffe's highest scoring ace at the time, Major Helmut Wick, on November 28, 1940. Dundas himself was shot down over the sea moments later. Dundas and Wick, both aged 25, were declared missing in action and neither has ever been found. Dundas had achieved 13½ victories in air combat.





series production jigs also created serious difficulties, as did building all-metal elliptical wings.

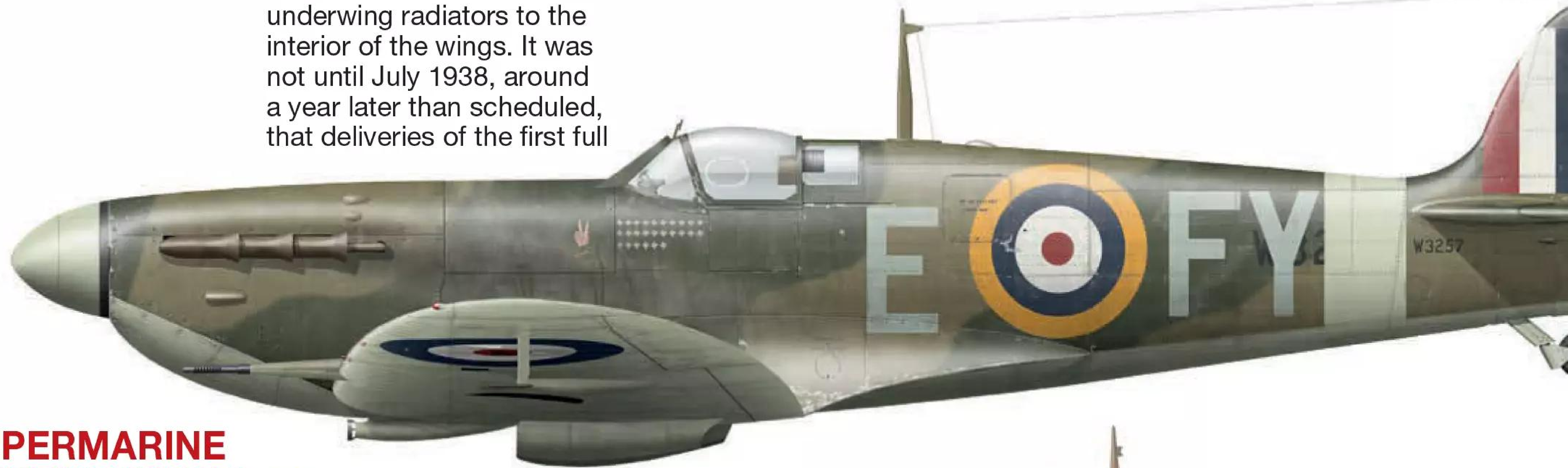
In practice, this amounted to each Spitfire taking twice as long as a Messerschmitt Bf 109E to build and two and a half times longer than a Hawker Hurricane. With Supermarine still struggling to get its act together, parent company Vickers was forced to bring in sub-contractors including General Aircraft, Westland, Folland and General Electric.

In the meantime, the lone prototype was the subject of continual improvements. Its eight machine guns were fitted in August 1936 along with a reflector gunsight and its radio kit. Its engine, actually a prototype for the Merlin C, produced 990hp and had six flush-fitting exhaust ports on either side.

As testing continued, it became evident that there was a problem with the wing guns freezing up. This first happened during firing trials in March 1937 and was eventually resolved by installing ducting which diverted hot air from the underwing radiators to the interior of the wings. It was not until July 1938, around a year later than scheduled, that deliveries of the first full

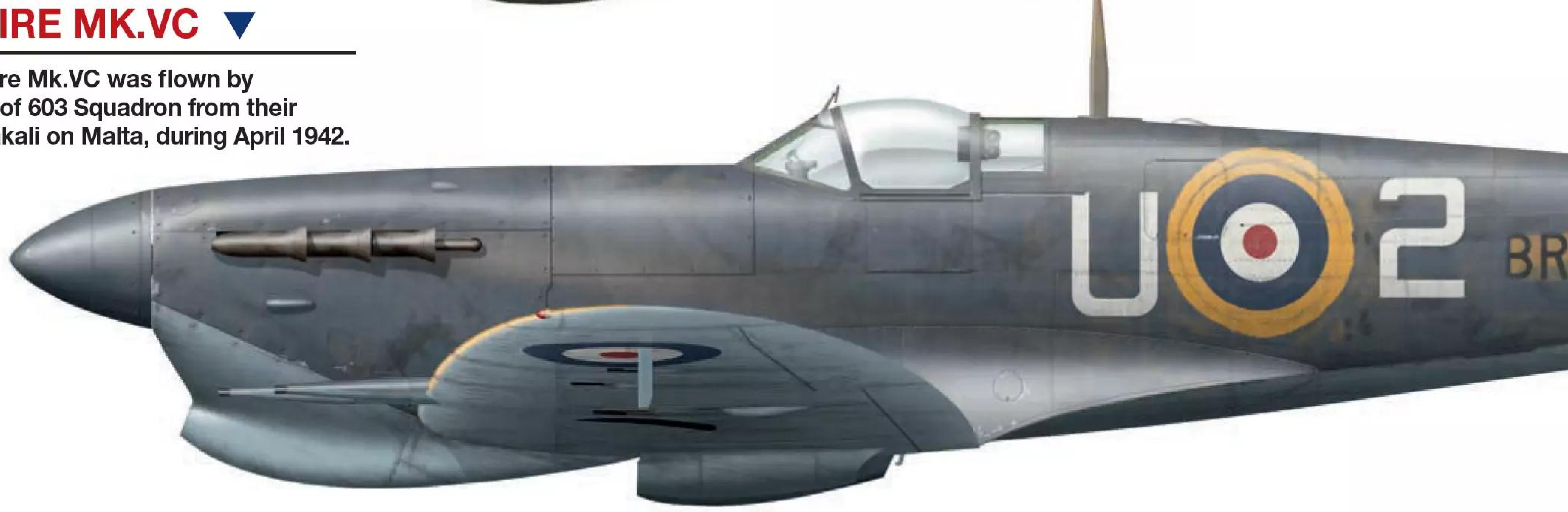
## SUPERMARINE SPITFIRE MK.VB ▼

**Despite his short stature, Flight Lieutenant Eric S 'Sawn off Lockie' Lock of 611 Squadron was one of the RAF's finest aces. He flew this Spitfire Mk.VB while stationed at Hornchurch in England on July 14, 1941. That day he shot down his third Bf 109 in just over a week. Three weeks later, on August 3, 1941, he peeled off from his formation to strafe a column on infantry on the ground near the Pas-de-Calais. He is believed to have been hit by ground fire during the attack but neither Lock nor W3257 were ever seen again. He was 22 years old and had achieved 26 victories in air combat plus one shared.**



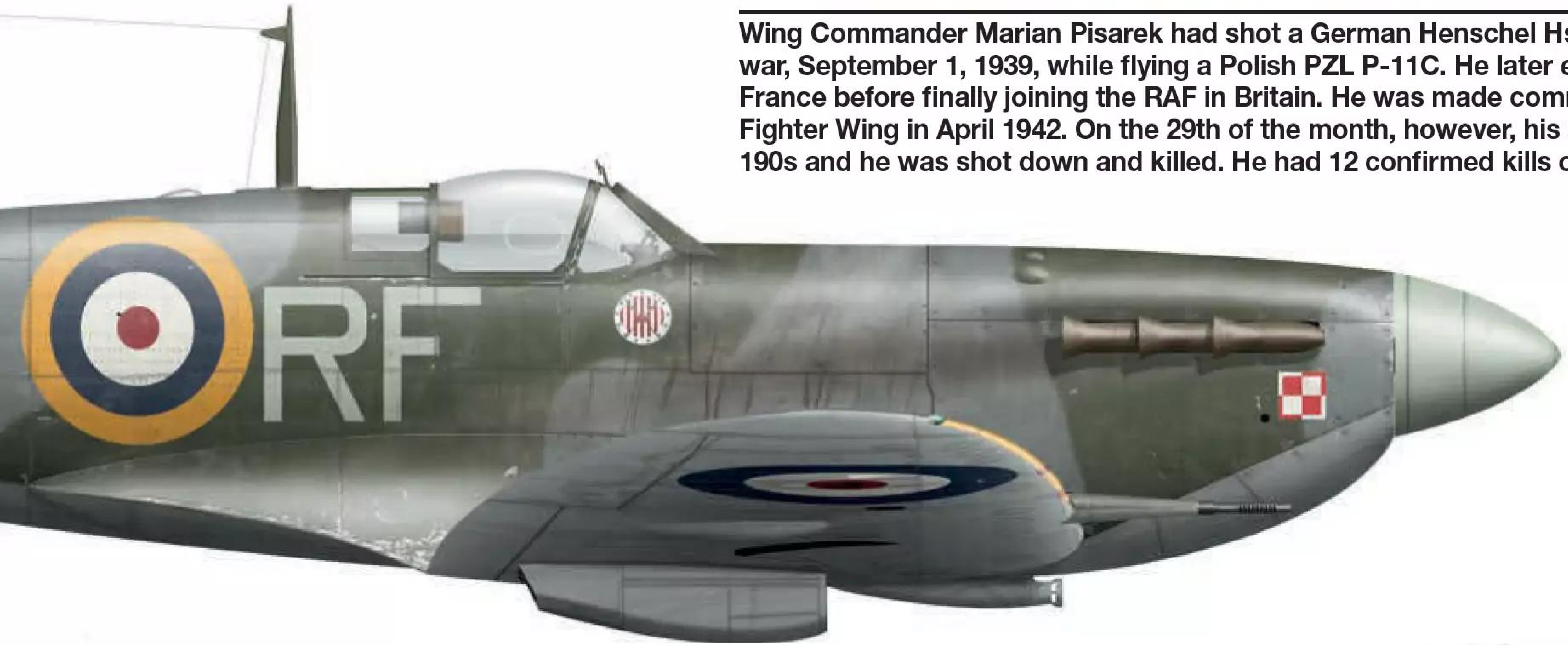
## SUPERMARINE SPITFIRE MK.VC ▼

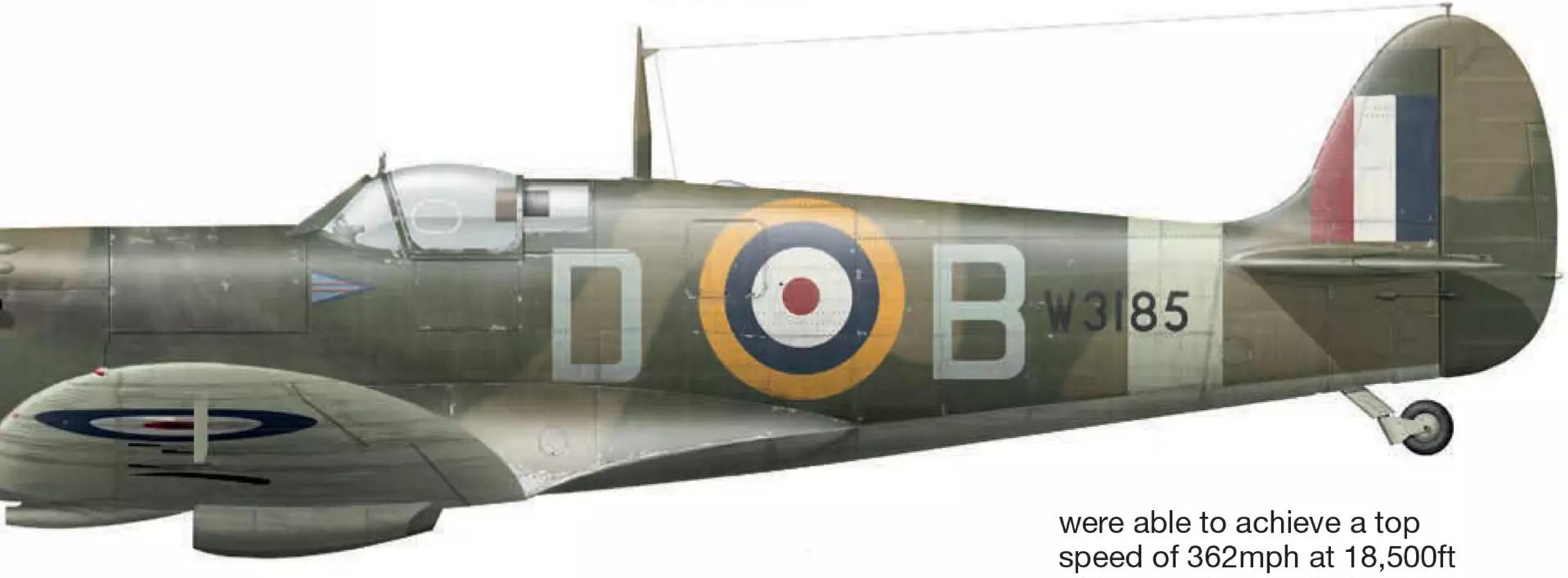
**This Spitfire Mk.VC was flown by members of 603 Squadron from their base at Takali on Malta, during April 1942.**



## SUPERMARINE SPITFIRE MK.VB ◀

**Wing Commander Marian Pisarek had shot a German Henschel Hs 126 on the first day of the war, September 1, 1939, while flying a Polish PZL P-11C. He later escaped to Romania, then France before finally joining the RAF in Britain. He was made commander of the 1st Polish Fighter Wing in April 1942. On the 29th of the month, however, his unit was attacked by Fw 190s and he was shot down and killed. He had 12 confirmed kills overall.**





## SUPERMARINE SPITFIRE MK.VA ▲

**Famous amputee ace Wing Commander Douglas R S Bader flew this Spitfire Mk.VA while stationed at Tangmere in England during July 1941. That month he shot down five Bf 109s and damaged or shared in several others, but the following month he was shot down and spent the rest of the war as a prisoner. He achieve 20 victories in air combat plus four shared.**

production Spitfire Mk.Is were finally being made to Fighter Command.

From late 1938 a Barr and Stroud GM 2 reflector gunsight was fitted to Spitfire Mk.Is. Now an order for another 1000 Spitfires was placed, with a new factory being built at Castle Bromwich expressly for this purpose. Further orders followed in 1939 for first another 200, then another 450 – a grand total of 2160.

With the 1030hp Merlin Mk.III engine fitted as standard, driving a 10ft 8in diameter Aero Products two-bladed wooden propeller, the earliest production Spitfires were able to achieve a top speed of 362mph at 18,500ft with a maximum climb rate of 2490ft per minute at 10,000ft. Service ceiling was 31,900ft.

However, from the 78th Spitfire, a three-bladed 9ft 8in diameter two-position metal de Havilland propeller was installed which improved service ceiling, up to 34,400ft, and top speed – up to 367mph. In addition, the 'flat' canopy of the earliest Spitfires was soon replaced with a 'blown' version which provided more headroom and better visibility, particularly to the rear. The handpump-operated undercarriage retraction system was also replaced with a hydraulic pump.

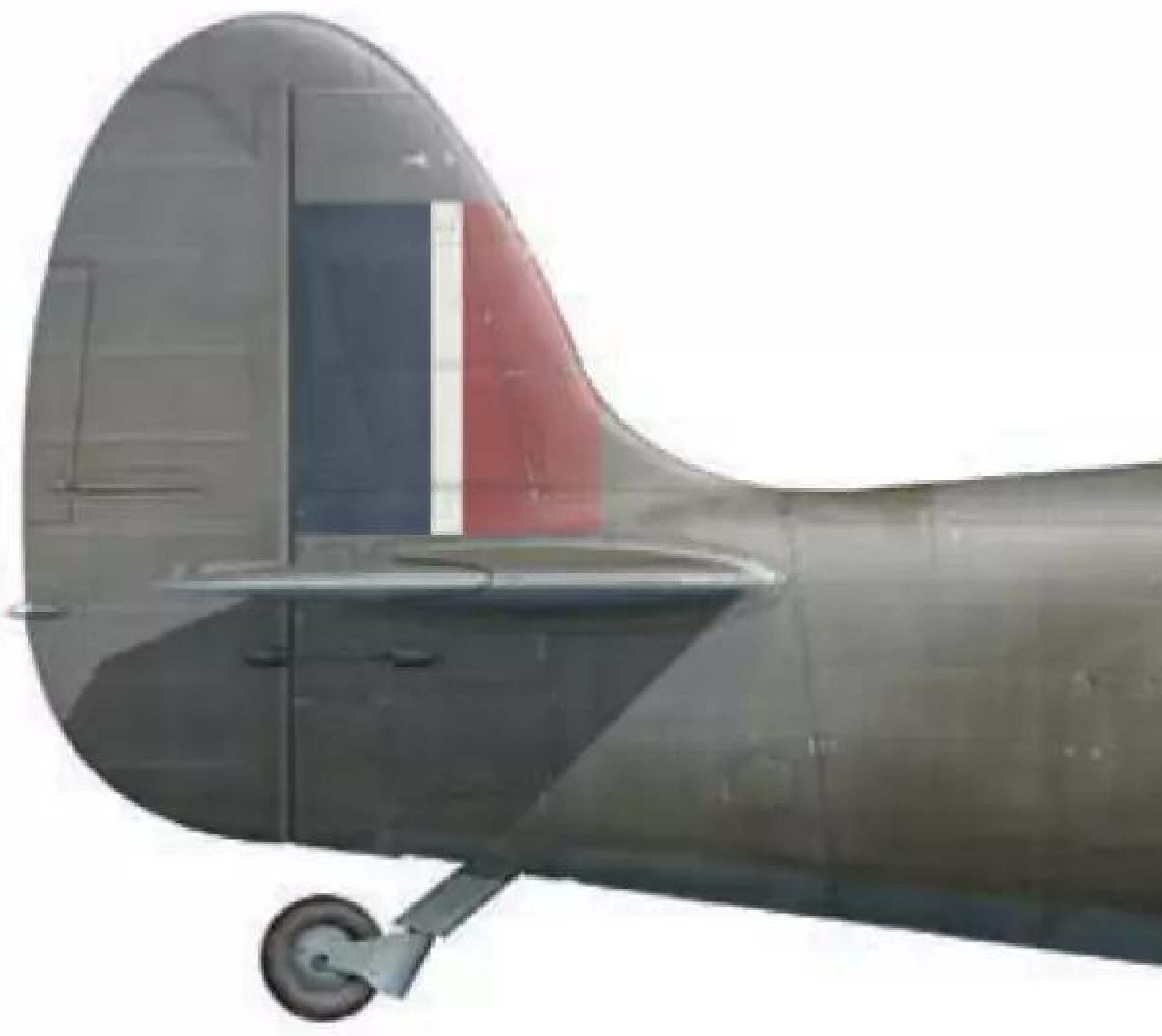
It was this version of the Spitfire that went to war in September 1939. From mid-1940, the Mk.I also received 73lb of steel armour plating for the pilot's seat and headrest, plus the front of the glycol header tank. An improved propeller from de Havilland – constant speed rather than two-position – was introduced

**THE FIRST CANNON-ARMED SPITFIRE WAS INTRODUCED DURING JUNE 1940**

from late June 1940 and Identification Friend or Foe (IFF) equipment for radar was installed from September 1940. This was outwardly visible as wires which ran from the tips of the tailplanes to the sides of the rear fuselage.

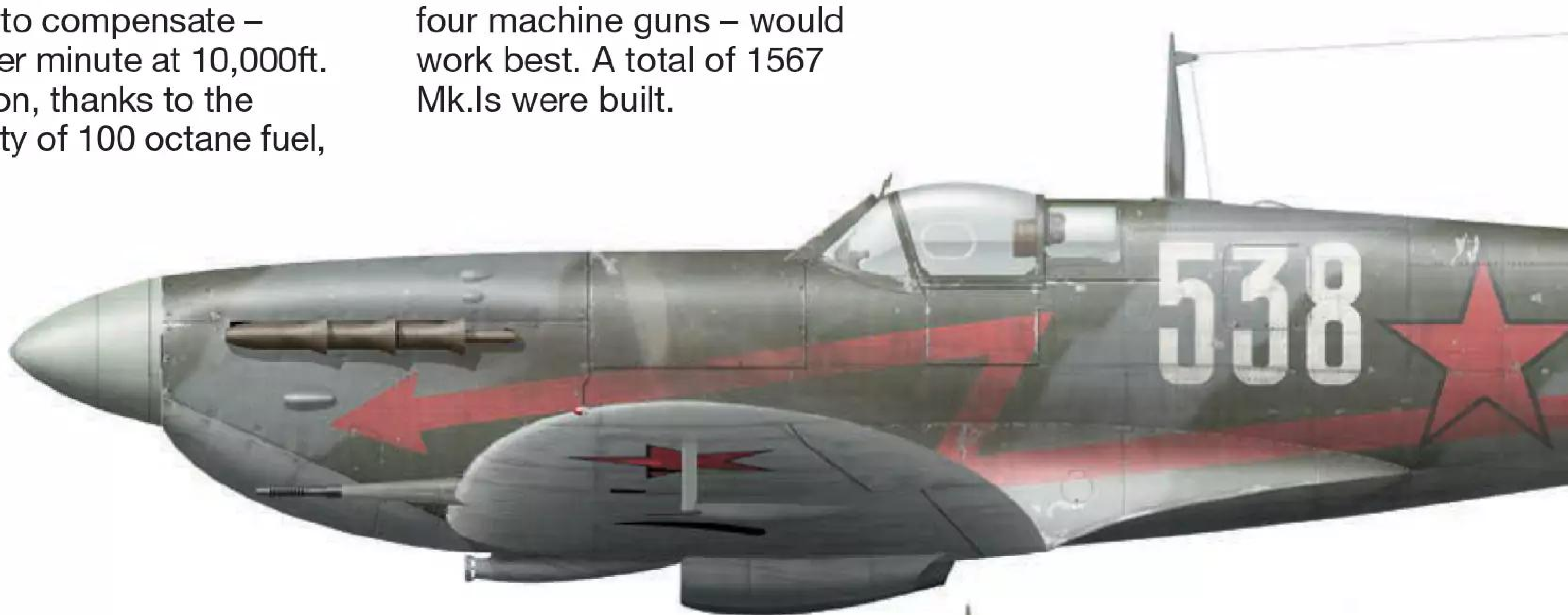
All of these changes resulted in substantially increased weight and the Spitfires that fought the Battle of Britain had a top speed on normal power of only 353mph at 20,000ft as a result. However, the constant speed propeller provided a significantly improved rate of climb to compensate – 2895ft per minute at 10,000ft. In addition, thanks to the availability of 100 octane fuel, Spitfire pilots could apply an 'emergency boost' for up to five minutes during combat. This effectively increase power to 1310hp at 9000ft and increased top speed by 34mph at 10,000ft.

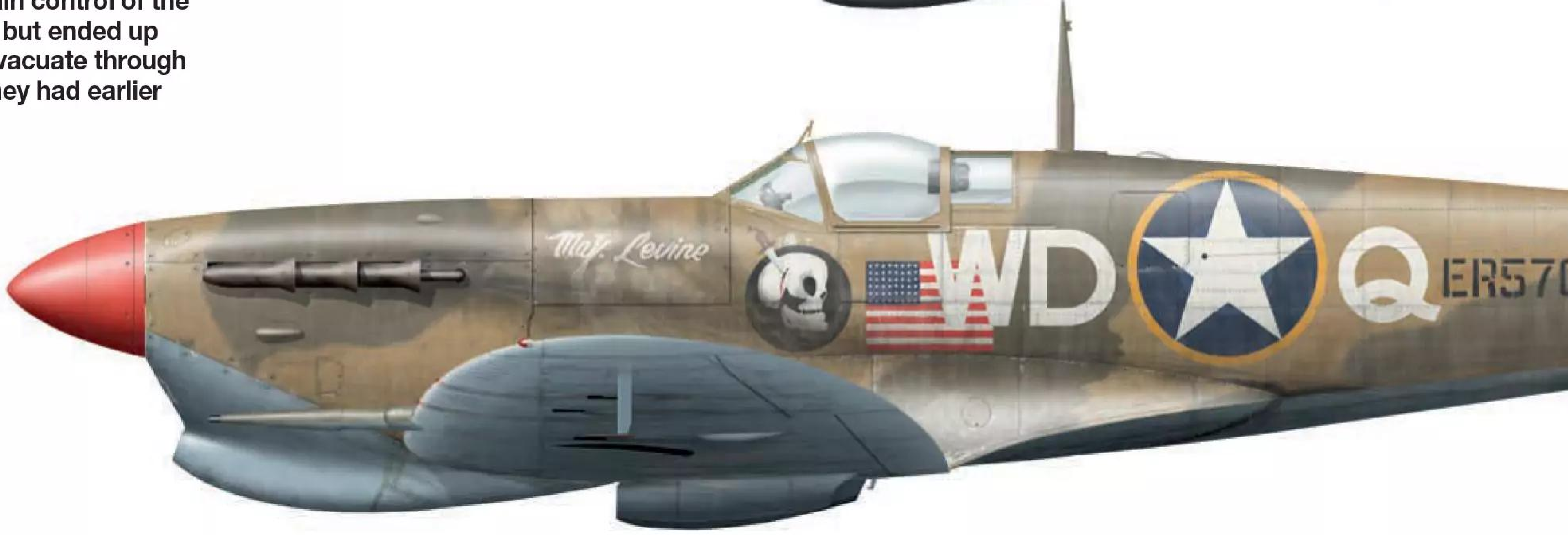
During June 1940, the RAF received its first Spitfire Mk.IBs. These were fitted with a single Hispano 20mm cannon in each wing, in place of the Browning machine guns. However, due to jamming problems with the cannon, it was decided that a compromise – two cannon and four machine guns – would work best. A total of 1567 Mk.Is were built.



## SUPERMARINE SPITFIRE MK.VB ▶

**More than 100 Spitfires Mk.VBs were shipped to the Soviet Union as war aid and this brightly coloured example was flown by 57 GIAP on the Kuban Front during April 1943. In this area of the Eastern Front, the Germans initially tried to gain control of the Caspian oil fields but ended up being forced to evacuate through the bridgehead they had earlier created.**



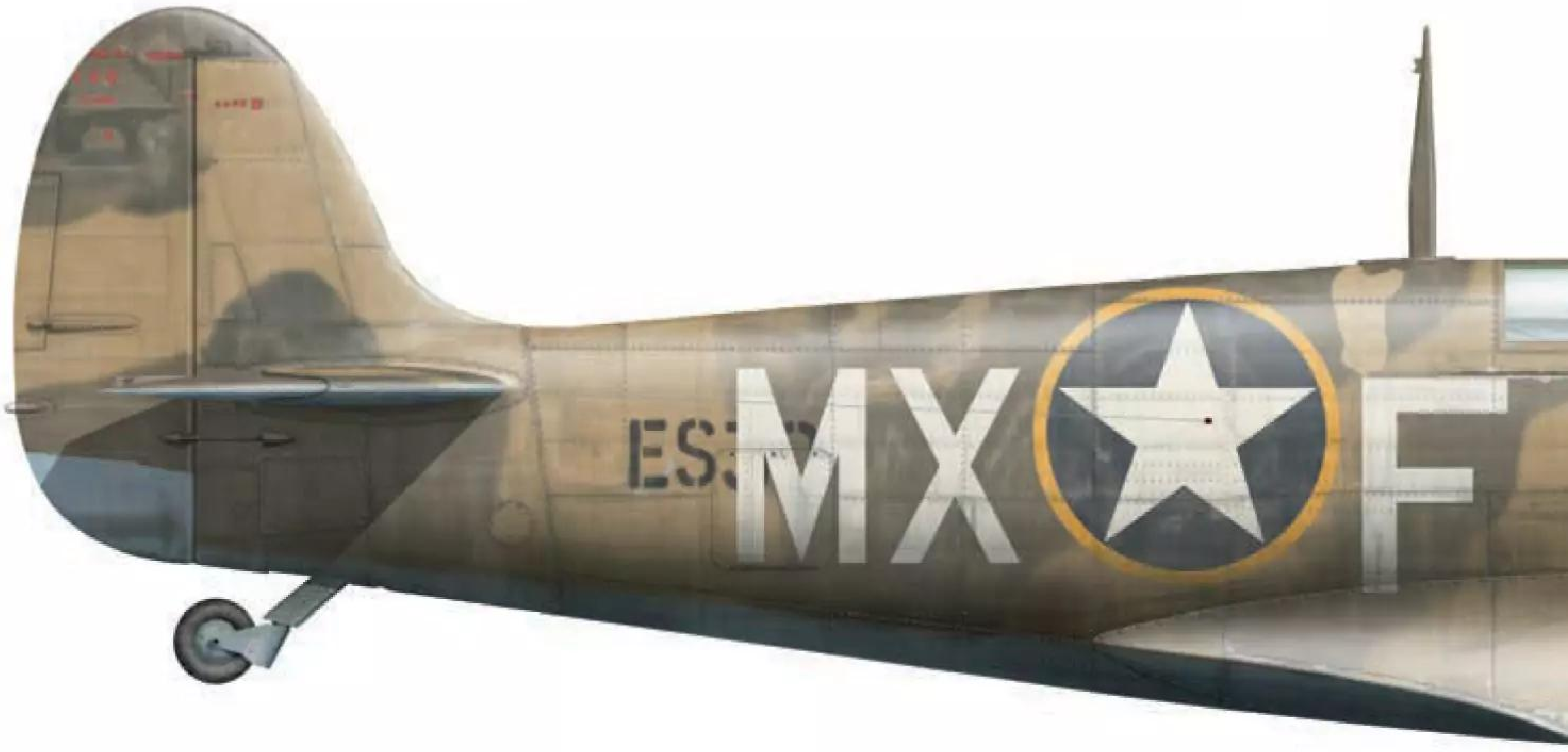


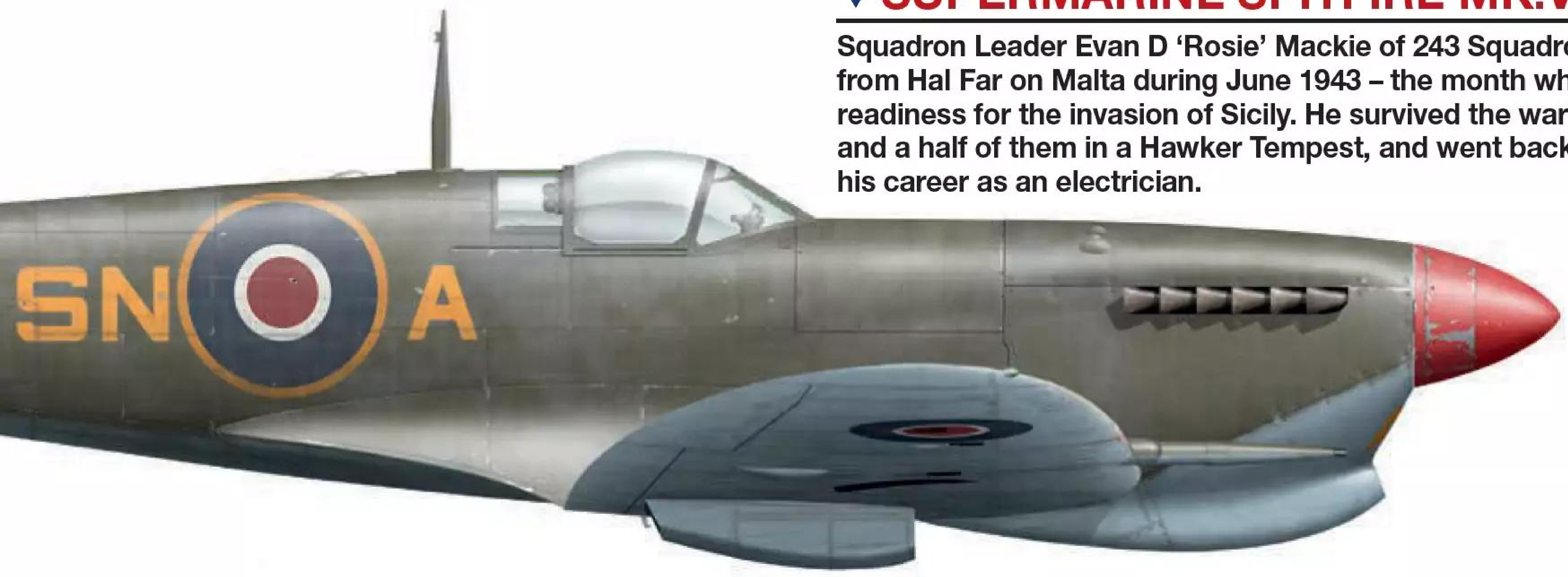
## SUPERMARINE SPITFIRE MK.VC TROP ▲

**Major Robert Levine of the 4th FG, 52nd FS, flew this desert camouflaged Spitfire Mk.VC Trop with its dagger-in-skull logo from La Sebala in Tunisia during June 1943.**

## SUPERMARINE SPITFIRE MK.VC TROP ▶

**This Spitfire Mk.VC Trop was flown by Lieutenant Ronald H Brown of the 31st FG, 307th FS, based at Licata, Italy, during July 1943.**





**SUPERMARINE SPITFIRE MK.VC TROP**

**Squadron Leader Evan D 'Rosie' Mackie of 243 Squadron flew this tropicalized Spitfire from Hal Far on Malta during June 1943 – the month when his unit moved to the island in readiness for the invasion of Sicily. He survived the war having achieved 20 victories, six and a half of them in a Hawker Tempest, and went back home to New Zealand to resume his career as an electrician.**

## SPITFIRE MK.II

During the summer of 1939, a production model Spitfire was tested with the new 1175hp Rolls-Royce Merlin XII. It was decided that this new version, the Mk.II would be built at Castle Bromwich and would feature a new Rotol-made 10ft 9in propeller which had already been fitted to some Mk.Is. Performance was improved at lower altitudes, though the Mk.II's absolute top speed was lower than that of the Mk.I due to weight increases. The Mk.II was available in both IIA eight machine gun and IIB cannon weapons configurations and fast deliveries from the factory meant that all Mk.Is had been replaced with Mk.IIs in front line units by April 1941. Several Mk.IIs were converted for long range bomber escort duties with the fitment of a fixed 40 gallon fuel tank under the port wing. In all, 921 Mk.IIs were built.

## SPITFIRE MK.III

For the Mk.III, which started out as the Supermarine Type 330, the Spitfire underwent a significant redesign. The new Rolls-Royce RM2SM engine, later redesignated Merlin XX, was installed producing 1390hp thanks to its two-speed supercharger. The aircraft's wingspan was significantly shortened from 36ft 10in to just 30ft 6in, and the fuselage was lengthened from 29ft 11in to 30ft 6in.

The undercarriage main legs were made stronger and raked forward slightly for added stability when the aircraft was on the ground and the tailwheel was now completely retractable. The cockpit was improved too, the windscreen being fitted with a new bulletproof panel, plus optically flat quarter panels made of glass.

While the Mk.III was flown as a prototype on March 16, going on to achieve a top speed of 400mph at 21,000ft, a shortage of Merlin XXs meant that it never went into production.

## SPITFIRE MK.IV/MK.XII

As early as December 1939, Supermarine had been considering the single-stage supercharged 1735hp 36.7 litre V12 Rolls-Royce Griffon as a new engine for the Spitfire. Unfortunately, the powerplant's development was delayed and the first flight of a Griffon Spitfire prototype, the Mk.IV, did not take place until November 27, 1941.

The shape of the Griffon meant that the Mk.IV was visually distinct from its predecessors, with large bulges

> A SIGNIFICANT REDESIGN OF THE SPITFIRE RESULTED IN THE MK.III

on the cowling over the cylinder heads and a teardrop fairing on the upper forward cowling over the magneto. The lower cowling had a shallower curve up to the spinner, and the spinner itself was much larger than those of earlier marks. The propeller itself was a four-bladed 10ft 5in Rotol type and as seen from the cockpit it rotated to the left, rather than to the right as with the Merlin.

The remainder of the Mk.IV was similar to the Mk.III. Pilots found that the Mk.IV prototype, DP845, had much more power on take-off than the Merlin Spitfire and tended to swing to the right – which had to be counteracted by moving the rudder to the left. The Mk.IV was fitted with mock-up installations for three cannon in each wing and then redesignated Mk.XX to prevent it being confused with the reconnaissance type Spitfire PR Mk.IV. It was redesignated again to Mk.XII.

TROPICALISED SPITFIRES FEATURED THE VISUALLY DISTINCTIVE VOKES AIR FILTER

## SPITFIRE MK.V

The next major production version of the Spitfire after the Mk.II was the Mk.V – which was essentially the same aircraft but fitted with the new Merlin 45 engine, which produced 1440hp with a single-speed single-stage supercharger. Work began on the new design immediately after the Battle of Britain, in late 1940. Changes to the carburettor at this point meant that the Spitfire was able to perform any manoeuvre without causing fuel flow problems. Previously, certain negative G aerobatic moves could result in the engine cutting out due to fuel starvation.

A number of Mk.I and Mk.II Spitfires were upgraded to Mk.V with the new powerplant but the majority were newly built at Castle Bromwich. The first version of the Mk.V, introduced in 1941, was the Mk.VA (Supermarine Type 331), with four .303 Brownings per wing. Its top speed was 375mph at 20,800ft and the climb up to that altitude could be accomplished in a little over seven minutes.

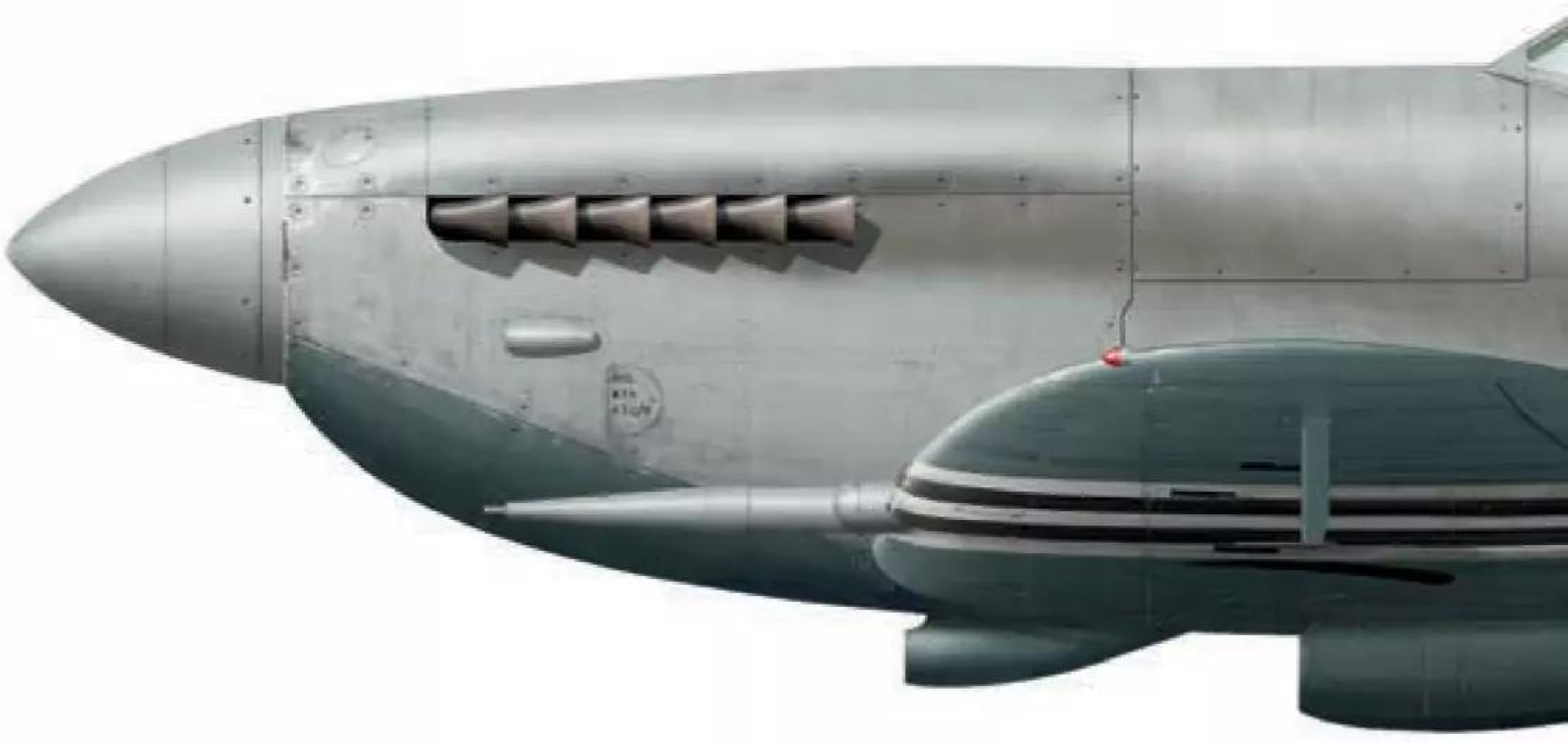
The second, and production standard version was the Spitfire Mk.VB (Supermarine Type 349), which featured a continuous flow of modifications throughout its relatively lengthy production lifespan. These included an improved windscreen like that of the Mk.III, a range of different propellers and spinners, a system for increasing the flow of hot air into the gun bays, the option to have 'clipped' wingtips to increase roll-rate and airspeed at low altitude – reducing wingspan to 32ft 2in – and the option to use 'slipper' drop tanks fitted beneath the wing centre section.

A variety of different versions of the Merlin 45 were fitted to Spitfire Mk.VBs too, such as the Merlin 45M with a smaller supercharger impeller.

A less numerous but more visually distinctive version was the Mk.VB (trop). A sizeable Vokes air filter was installed under the aircraft's nose to prevent dust, dirt and sand from tropical or desert environments entering the

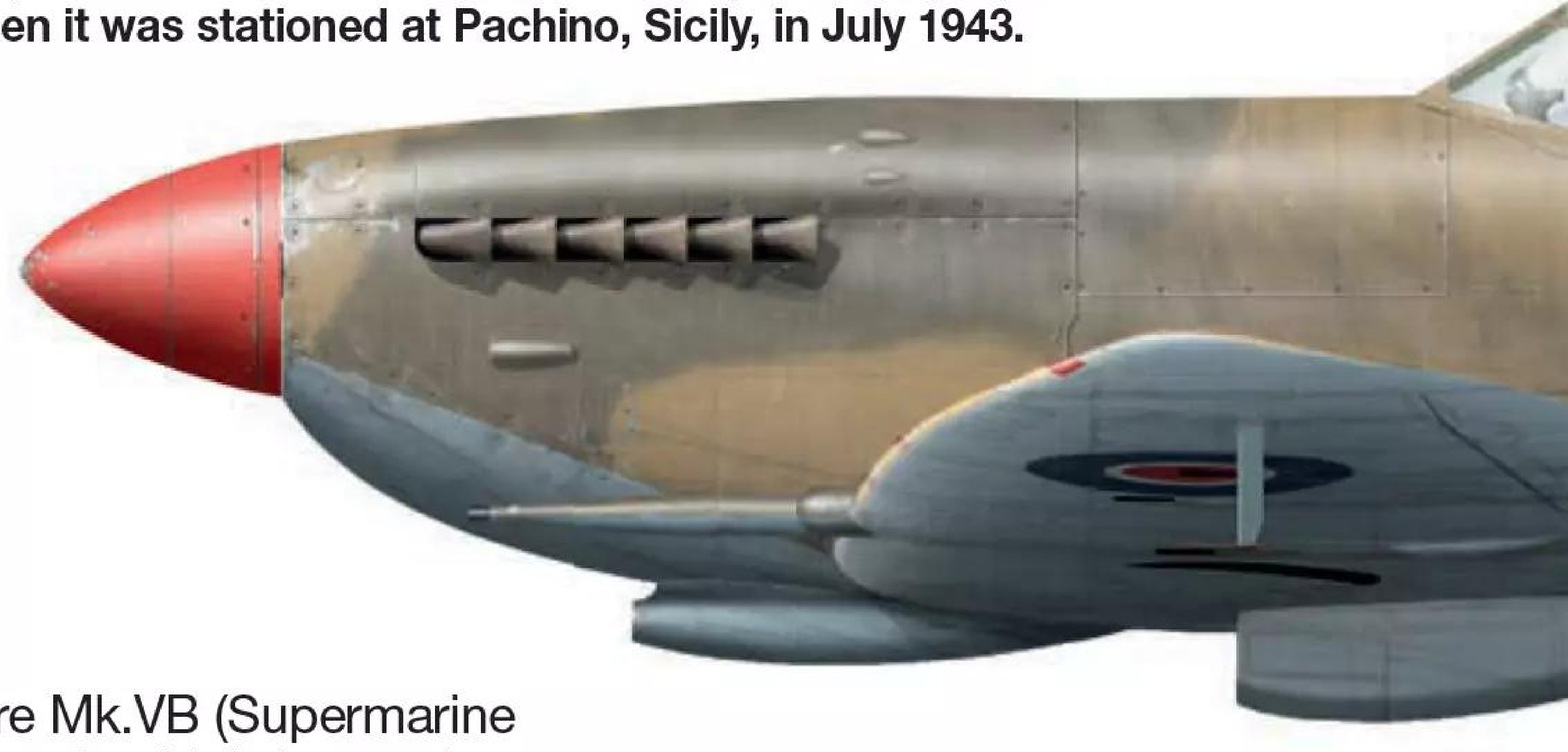
### SUPERMARINE SPITFIRE HF MK.VII ▼

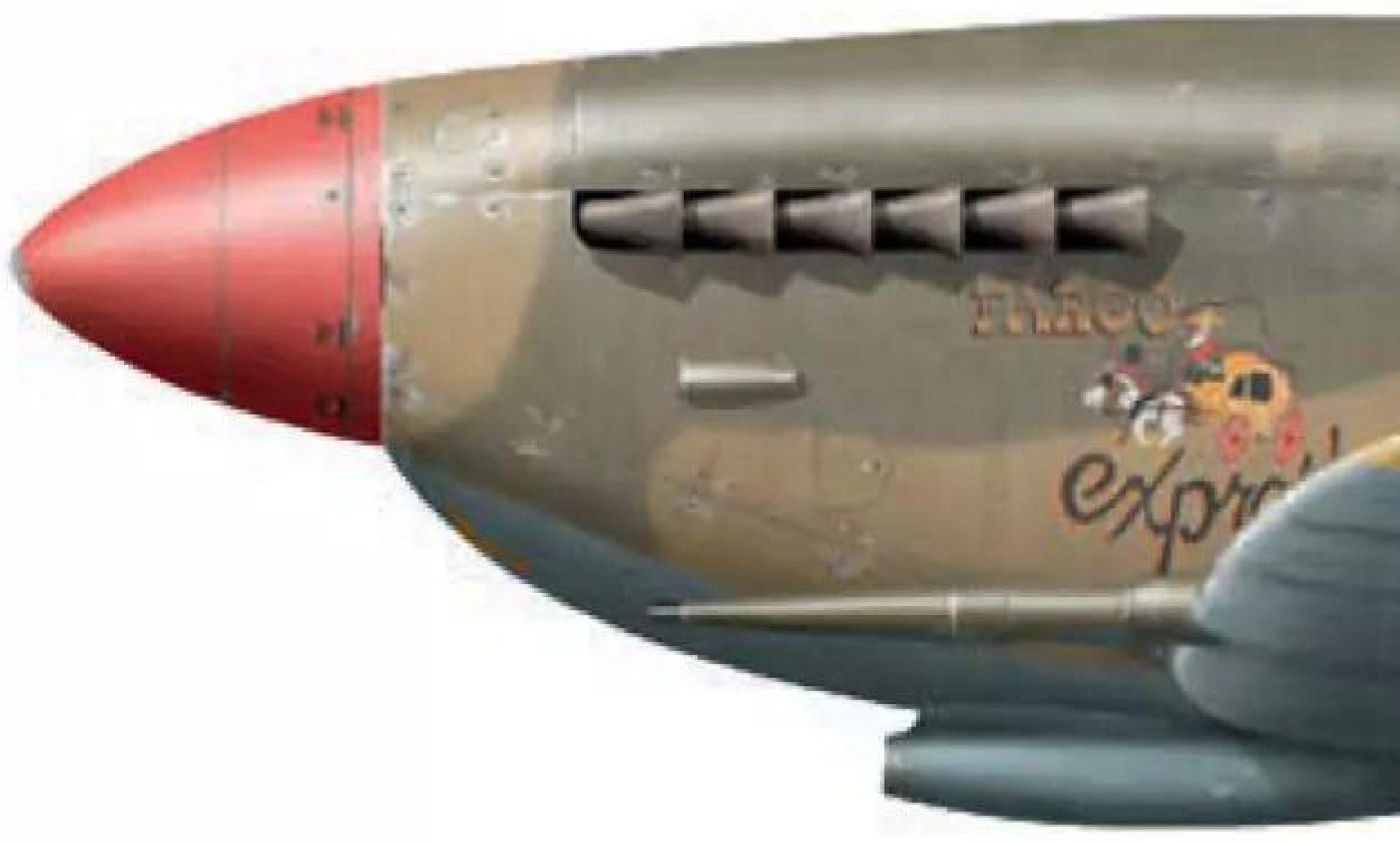
**Pilots of 131 Squadron, stationed at Culmhead in Somerset, England, flew this invasion-striped Spitfire Mk.VII during August 1944.**

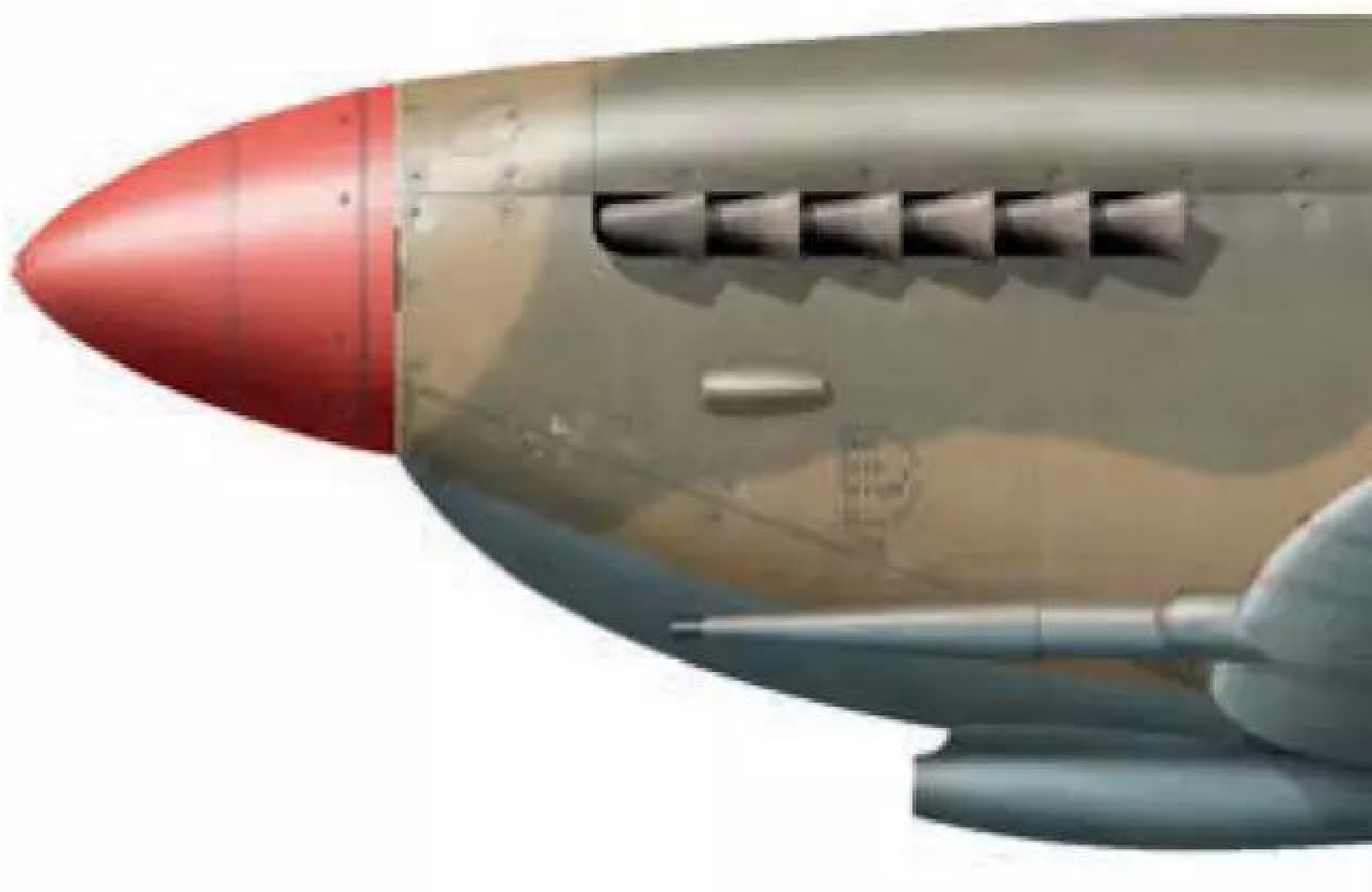


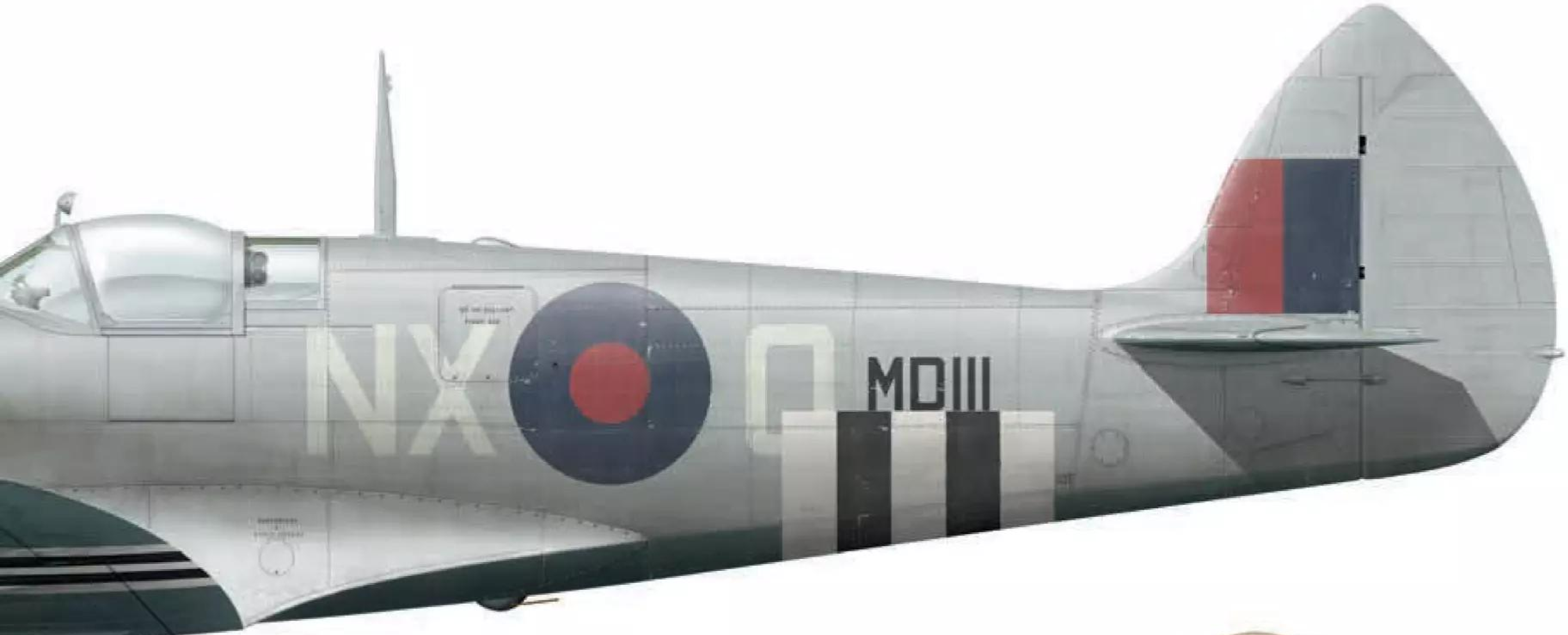
### SUPERMARINE SPITFIRE MK.VIII ▼

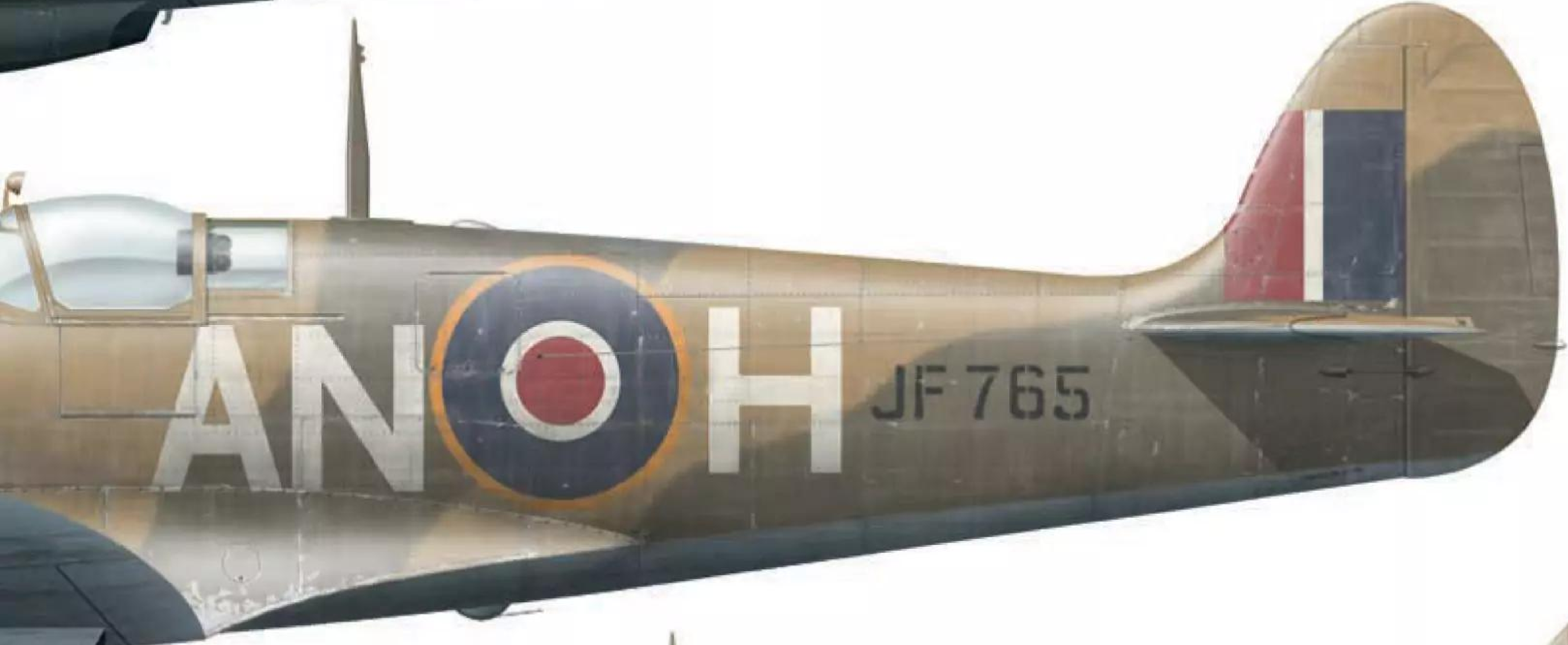
**A Spitfire Mk.VIII that served with 417 (Canadian) Squadron when it was stationed at Pachino, Sicily, in July 1943.**





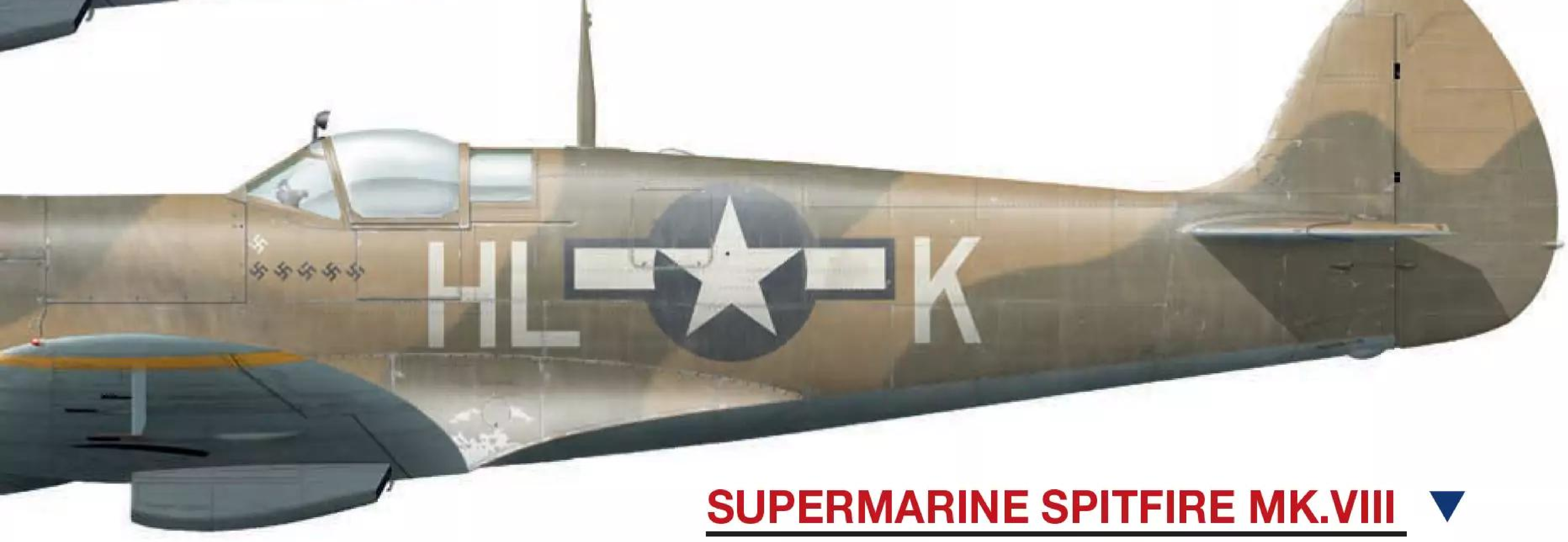






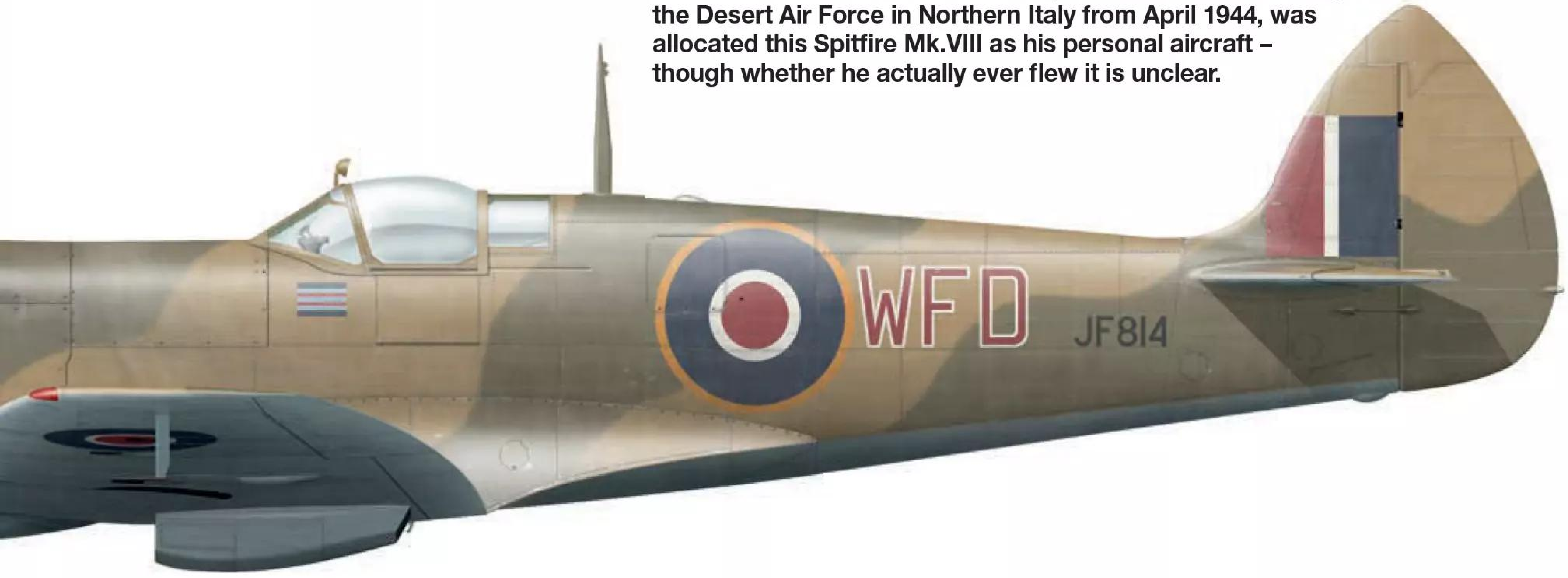
## SUPERMARINE SPITFIRE MK.VIII

**American ace 1st Lieutenant Leland P 'Tommy' Molland of the 308th FS, 31st FG, flew this Spitfire Mk.VIII while stationed at Castel Volturno in Italy on January 22, 1944 – the day he shot down a Fw 190. Having achieved five victories flying Spitfires, Molland converted to P-51s on March 24, 1944, and ended the war with a total 10 and a half 'kills'.**



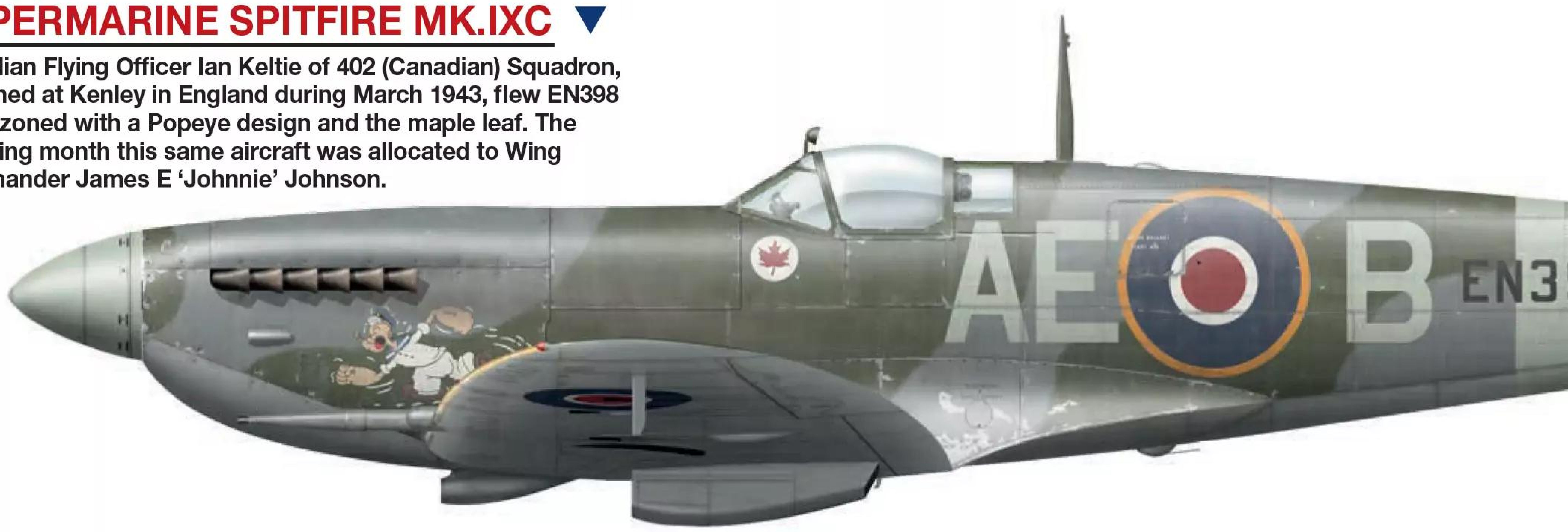
## SUPERMARINE SPITFIRE MK.VIII

**A Royal Naval Air Service pilot during the First World War, Air Vice Marshal William F Dickson, Air Officer Commanding the Desert Air Force in Northern Italy from April 1944, was allocated this Spitfire Mk.VIII as his personal aircraft – though whether he actually ever flew it is unclear.**



## SUPERMARINE SPITFIRE MK.IXC

**Canadian Flying Officer Ian Keltie of 402 (Canadian) Squadron, stationed at Kenley in England during March 1943, flew EN398 emblazoned with a Popeye design and the maple leaf. The following month this same aircraft was allocated to Wing Commander James E 'Johnnie' Johnson.**



engine. This cut top speed by 8mph and reduced climb rate by 600ft per minute but enabled the Spitfire to operate in harsh conditions around the world.

The second revision of the type was the Mk.VC (Supermarine Type 349). This featured a strengthened fuselage, new windscreen, a revised undercarriage, a deeper radiator fairing under the starboard wing, a larger oil cooler with kinked air outlet under the port wing, C-type wings and armour for the bottom of the pilot's seat and wing ammunition boxes. With the appropriate gear, it was also able to carry a single 250lb bomb under each wing – a first for a Spitfire.

The C-type wing was designed to be easier and faster to manufacture and could be reconfigured for a number of different weapons arrangements – most commonly two cannon and four machine guns.

A tropicalized version of the Mk.VC was sent overseas in large numbers to be used in the Mediterranean and Pacific theatres.

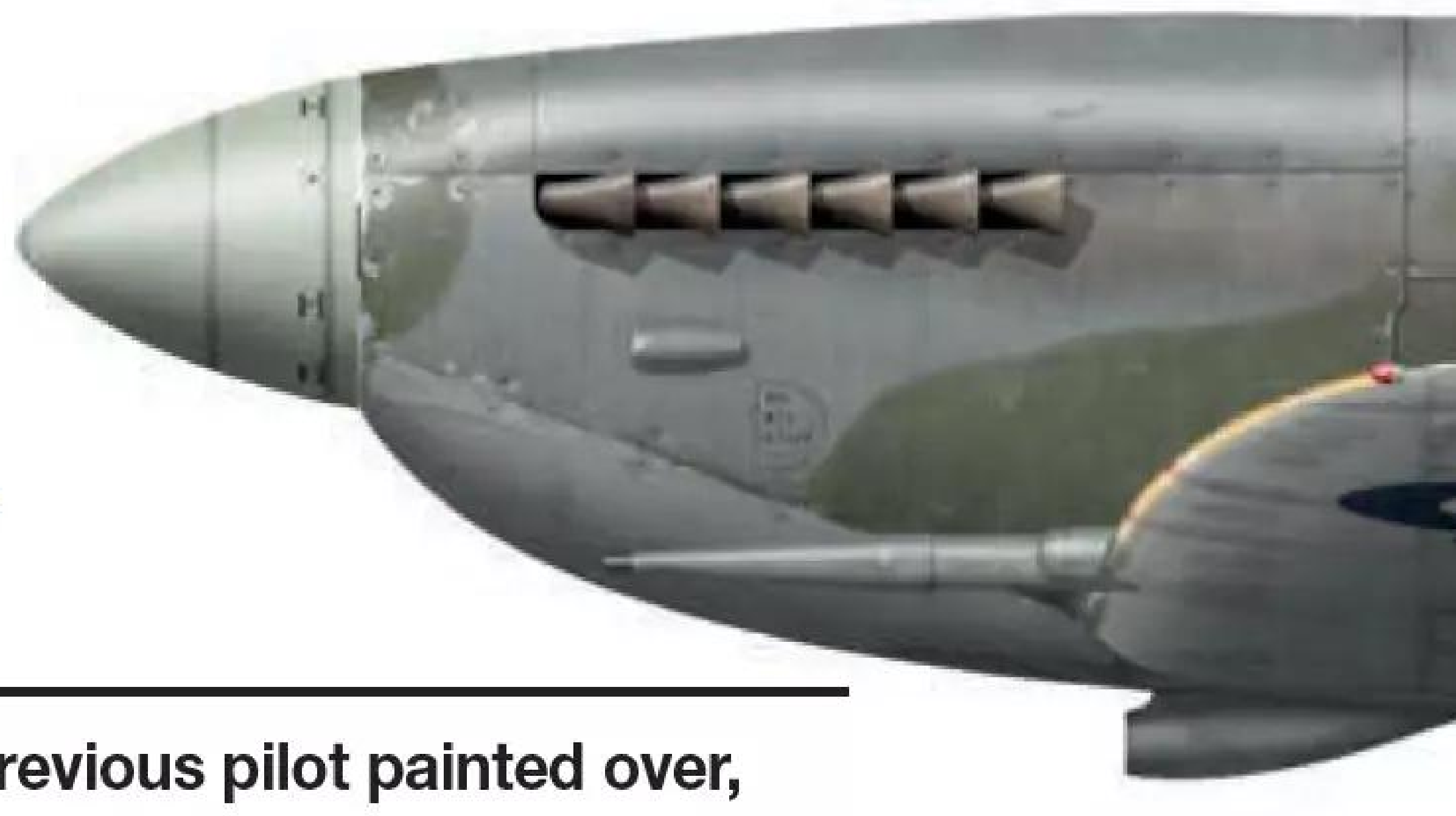
Overall Spitfire Mk.V production totalled 6479. Just 94 of these were Mk.VAs, 3911 were Mk.VBs and 2467 were Mk.VCs.

### SPITFIRE MK.VI

Work on designing the Mk.VI (Supermarine Type 351) took place in parallel to work on the Mk.V. It was to be the first Spitfire equipped with a pressurised cockpit for combating German high-altitude bombers if they

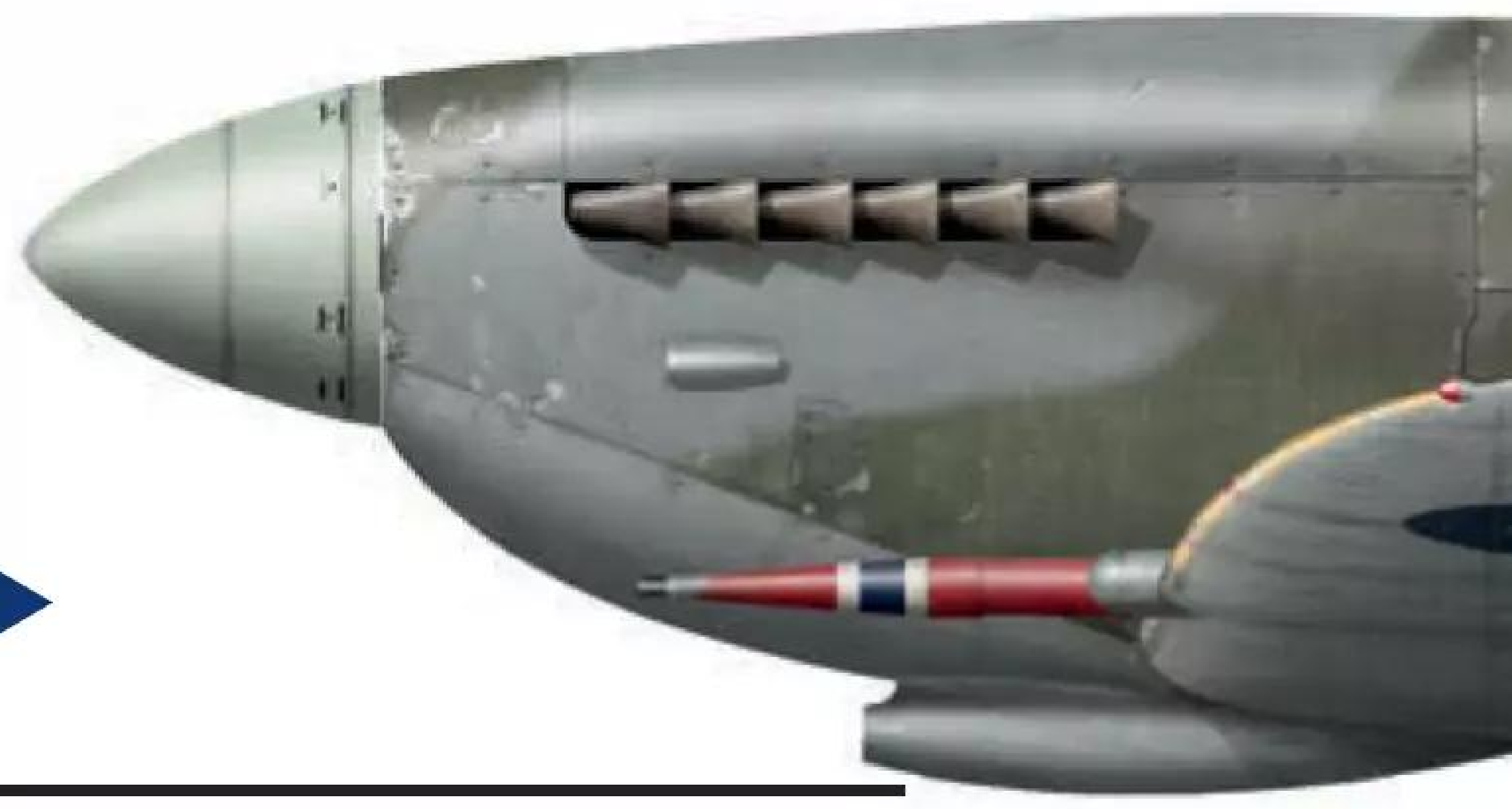
**WHEN THE FW 190 APPEARED THE SPITFIRE MK.VB WAS OUTCLASSED**

## SUPERMARINE SPITFIRE MK.IXC

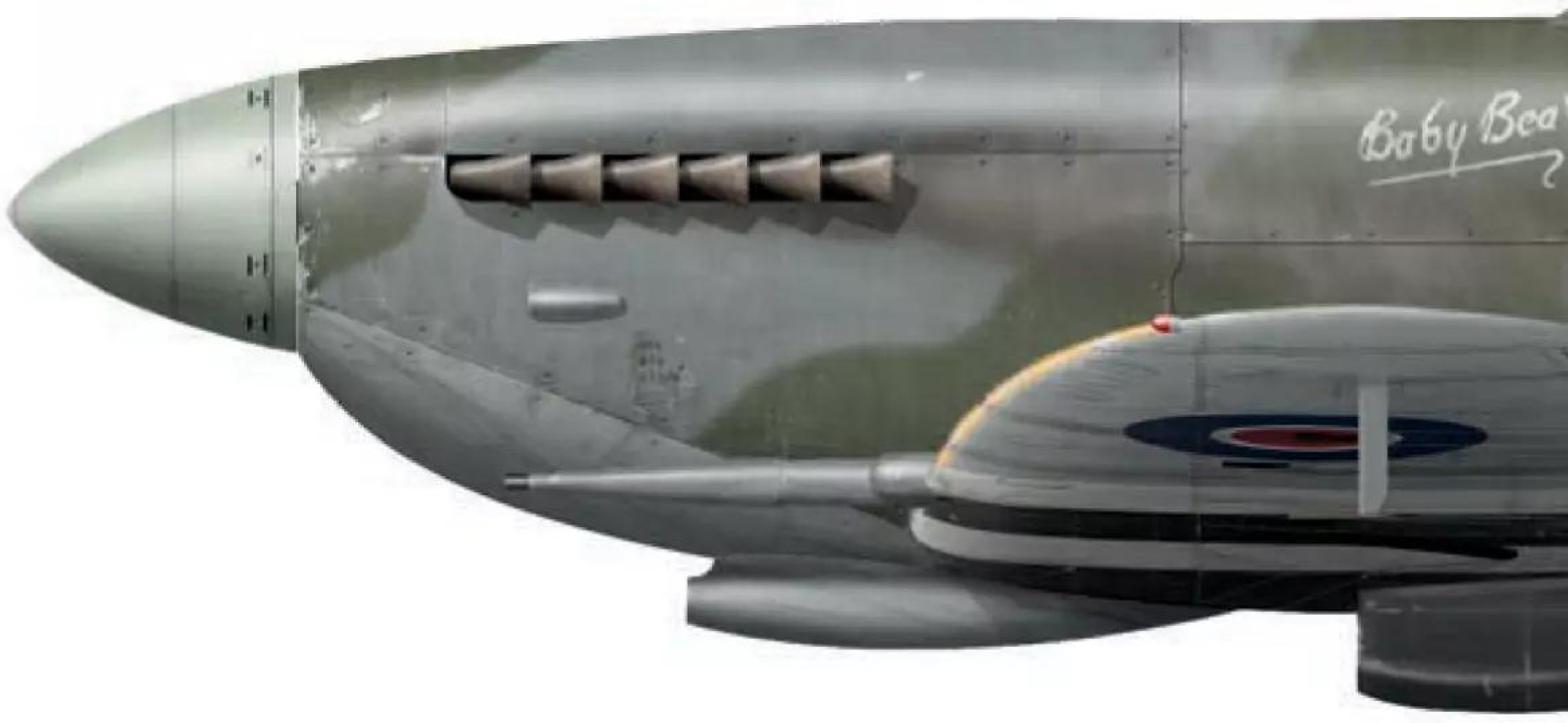


**With the Popeye artwork of its previous pilot painted over, EN398 was flown by Wing Commander James E 'Johnnie' Johnson during April 1943. Johnson flew 700 operational sorties and engaged the enemy on 57 occasions. During these battles he achieved 34 combat victories plus 7 shared. Having survived the war, he later served in Korea before retiring in 1966 with the rank of air vice marshal. He died in 2001 aged 85.**

## SUPERMARINE SPITFIRE MK.IXC



**The leading Norwegian ace of the Second World War, Kaptein Svein Heglund of 331 (Norwegian) Squadron, stationed at North Weald, England, flew this Spitfire Mk.IXC during August 1943. Having been in Switzerland when the Germans invaded Norway, he travelled to New York via France and Britain. He then went to Canada before returning to Britain and joining the RAF, initially flying Hurricanes. His unit later received Spitfires. Finally, in May 1943, he joined 331 (Norwegian) Squadron and went on to shoot down 12 enemy aircraft with five probables up to November. He then transferred to RAF Ferry Command. Heglund ended the war with 16 victories and died in 1998 aged 79.**

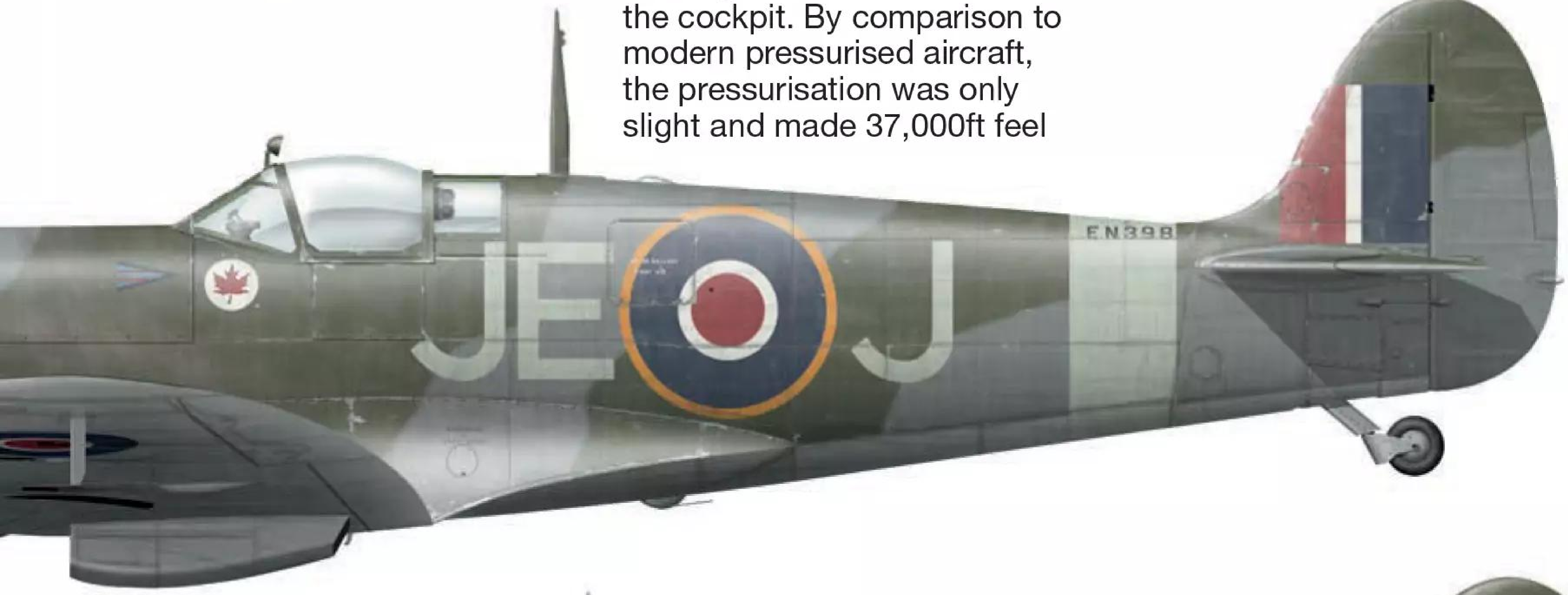


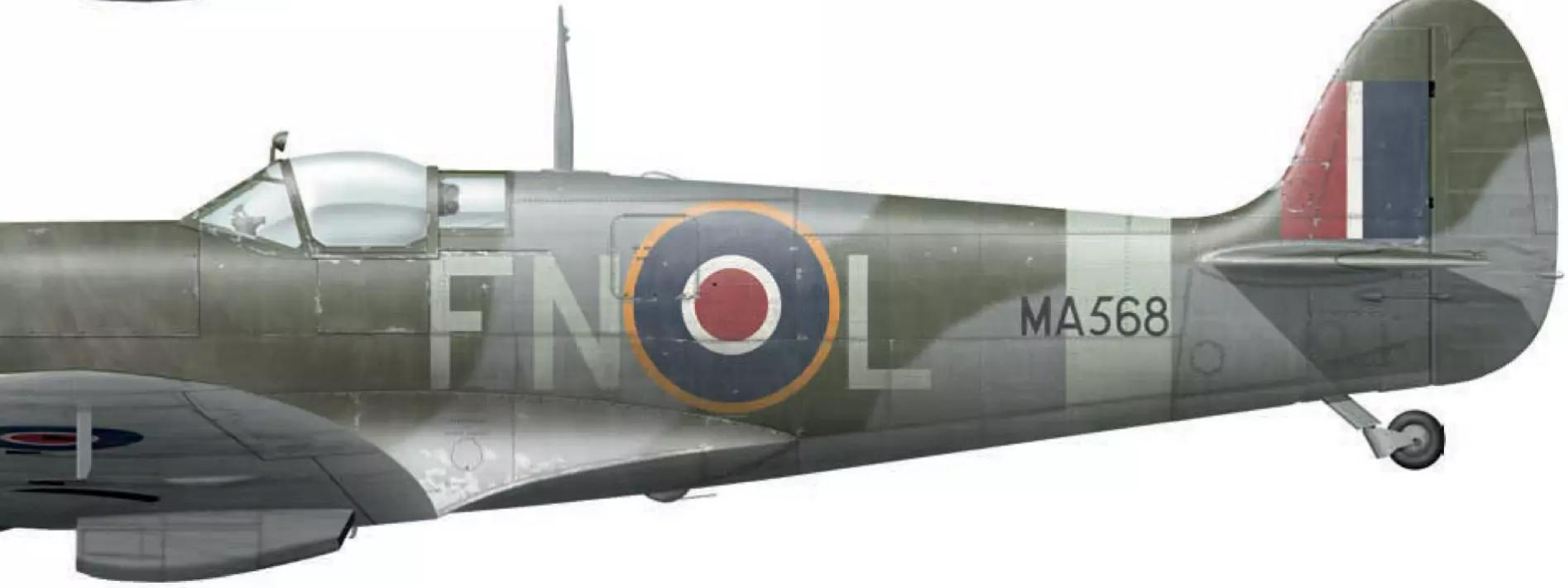
appeared. The pressurisation was to be carried out using a Marshall compressor and the forward and rear cockpit bulkheads were sealed, with rubber grommets for all the cables, wires and tubes that needed to pass into the cabin.

A new non-sliding canopy was introduced which had to be locked into position over the pilot once he had climbed aboard, then sealed by inflating a rubber tube inside the cockpit. By comparison to modern pressurised aircraft, the pressurisation was only slight and made 37,000ft feel more like 28,000ft for the pilot.

The Mk.VI was powered by a Merlin 47 and fitted with a Rotol propeller with four wide blades designed to improve performance in the thinner air at higher altitudes. The standard B-type wings were modified to incorporate pointed tips, which resulted in a wingspan of 40ft 2in.

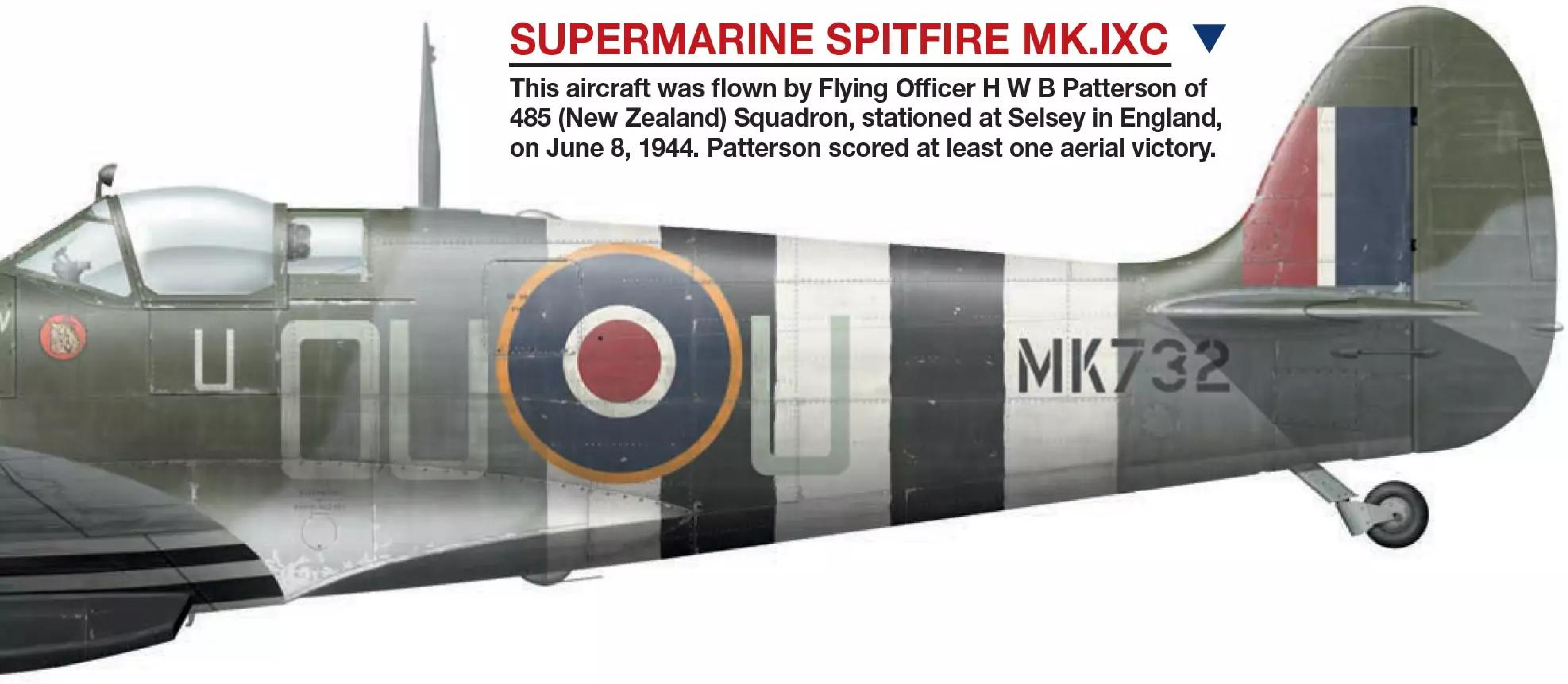
Top speed was just 356mph at 21,800ft but service ceiling

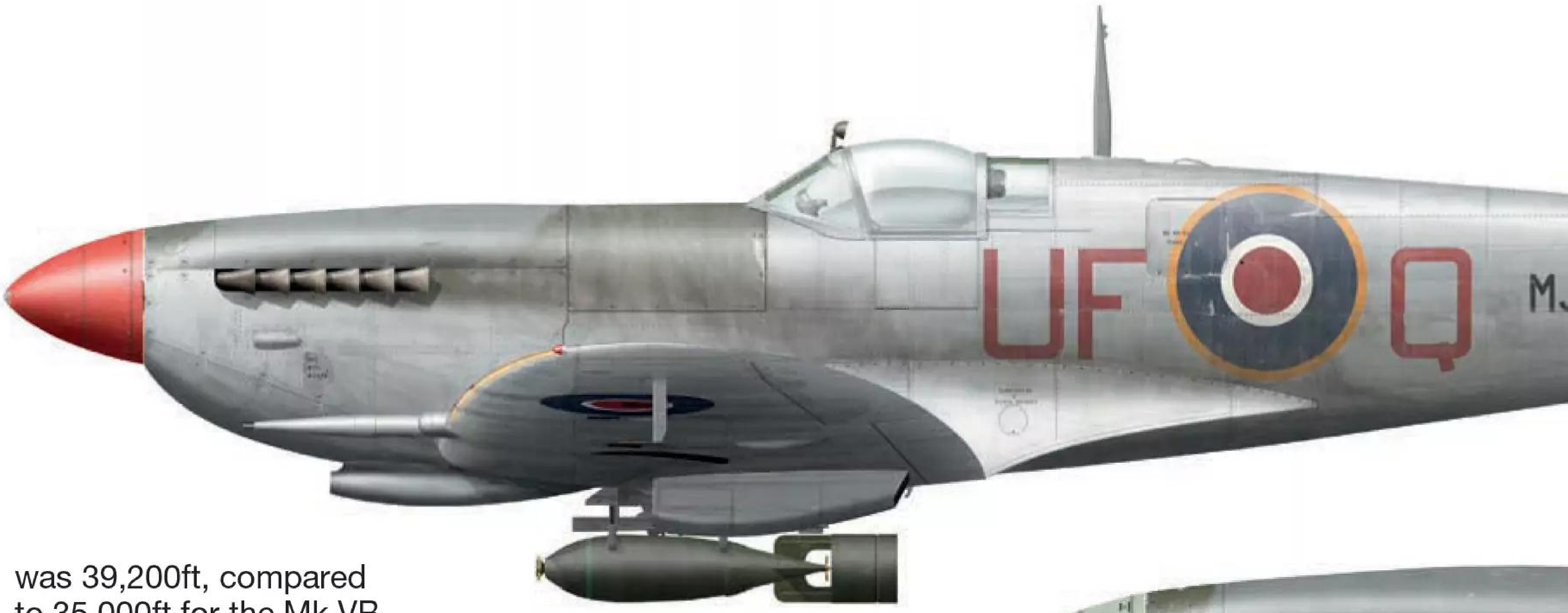




### SUPERMARINE SPITFIRE MK.IXC

**This aircraft was flown by Flying Officer H W B Patterson of 485 (New Zealand) Squadron, stationed at Selsey in England, on June 8, 1944. Patterson scored at least one aerial victory.**





**EVEN AT THE WAR'S END, THE MK.IX COULD STILL OUTPERFORM MOST OF ITS OPPONENTS**

was 39,200ft, compared to 35,000ft for the Mk.VB. Only 100 Mk.VIs were made because the Germans never put a high-altitude bomber into full series production, let alone front line service.

## SPITFIRE MK.VII

The performance of the Mk.VI had been disappointing so the Mk.VII represented an attempt to make improvements. With a similar pressurised cockpit to that of the Mk.VI, it was now powered by a Merlin 64 with a two-stage two-speed supercharger. It had pointed-tip wings like the Mk.VI, but derived from the C-type rather than the B-type. Although early versions had the same jettisonable hood as the Mk.VI, this was later replaced with a more conventional sliding version – albeit double glazed.

The new engine meant the Mk.VII's performance was significantly improved over that of the Mk.VI, with a service ceiling of 45,100ft. A total of 140 were built.

## SPITFIRE MK.VIII

With the Luftwaffe's introduction of the Focke-Wulf Fw 190, the Spitfire Mk.VB was outclassed and an improved version was urgently needed. This was intended to be the Mk.VIII (Supermarine Type 360). It was very similar to the Mk.VII but without the pressurised cockpit. Some even featured the same pointed wingtips but most had standard wings. Unfortunately, neither the Mk.VII nor the Mk.VIII were ready in time, so in the interim a new version of the Spitfire, the Mk.IX detailed below, was introduced in 1942.

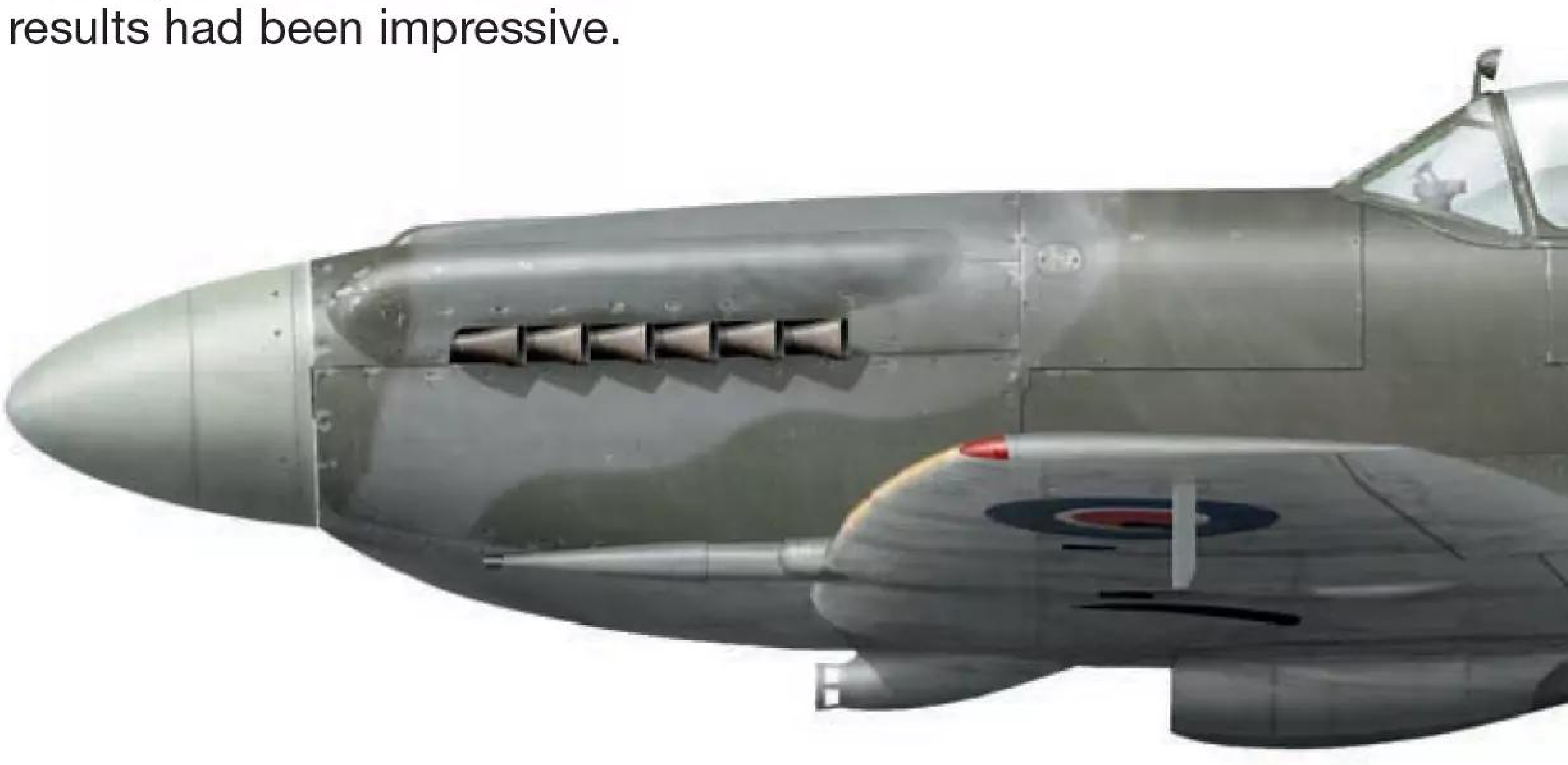
There were three main versions of the Mk.VIII – the Merlin 66-powered LF for low altitude operations, capable of 404mph at 21,000ft; the Merlin 63-powered F for medium altitude, capable of 408mph at 25,000ft; and the HF, with Merlin 70, for high altitude work – which could reach 416mph at 26,500ft.

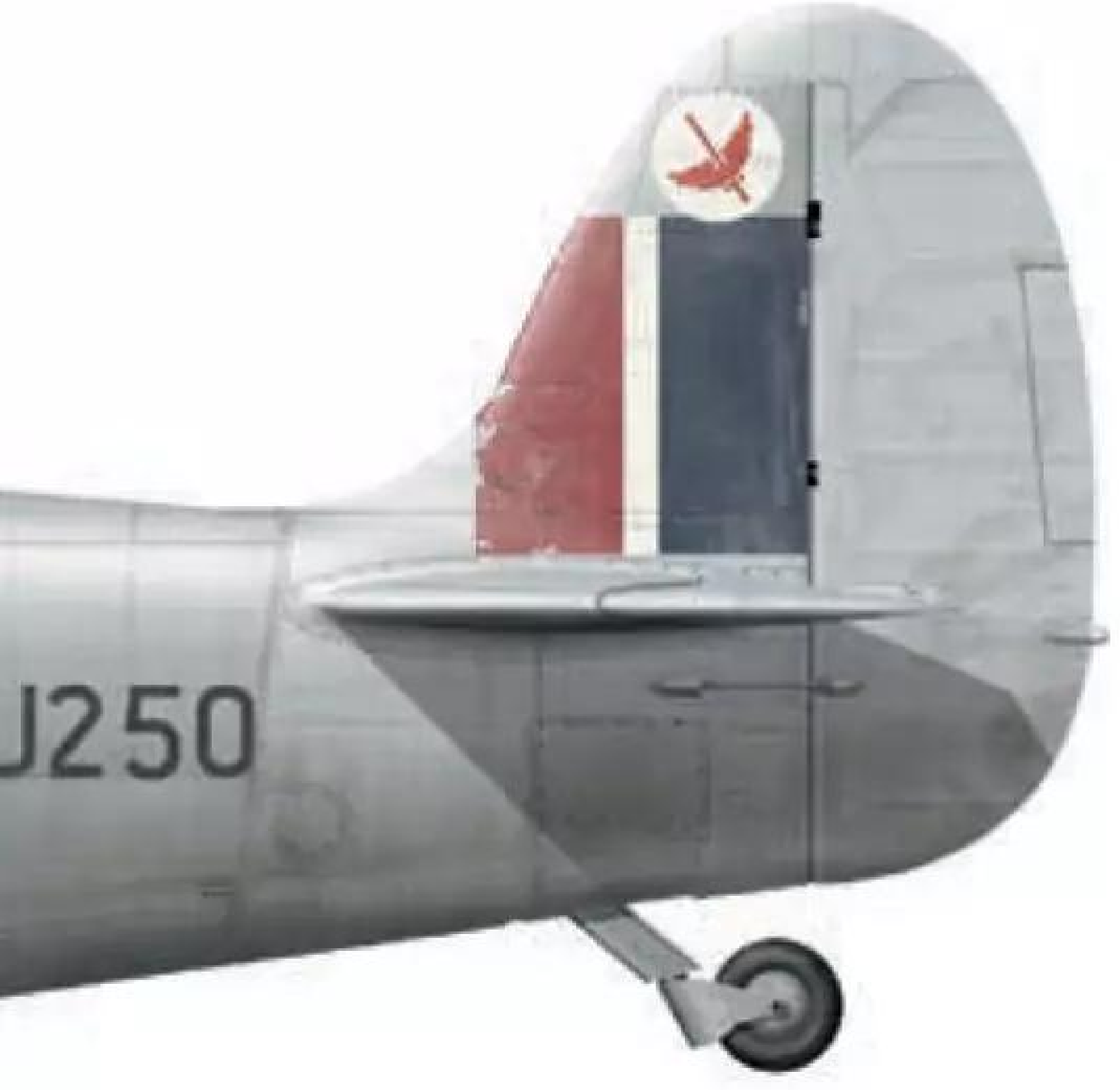
The Mk.VIII's main fuel tanks were extended to give a range of 660 miles or 1180 miles with a drop tank. With a slipper tank, it could manage 1500 miles. An external bomb load of up to 1000lb was possible.

The Mk.VIII was mostly used outside the European theatre – in the Mediterranean, the Pacific and in China-Burma-India. Overall, 1658 Mk.VIIIs were built, making it the third most numerous Spitfire type after the Mk. IX and Mk.V.

## SPITFIRE MK.IX / MK.XVI

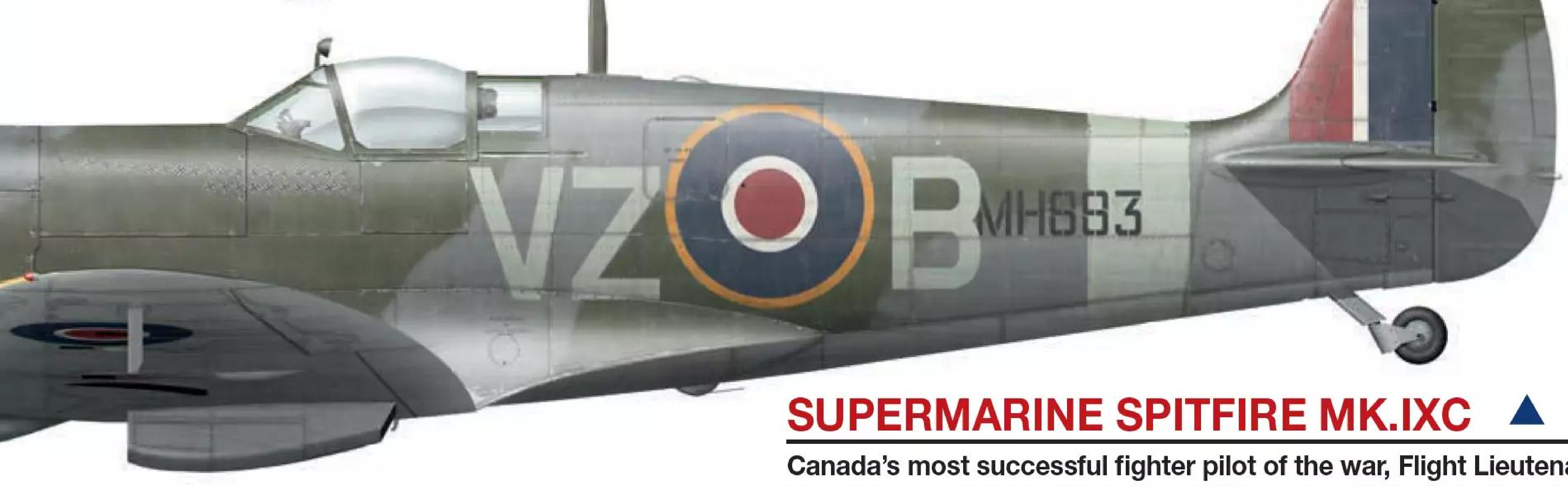
With the next generation Spitfire Mk.VII and Mk.VIII taking time to prepare, a stopgap was needed to combat the Fw 190. A Mk.III had been tested with the new Merlin 61 – originally designed for the Wellington Mk.VI high-altitude bomber – in September 1941 and the results had been impressive.





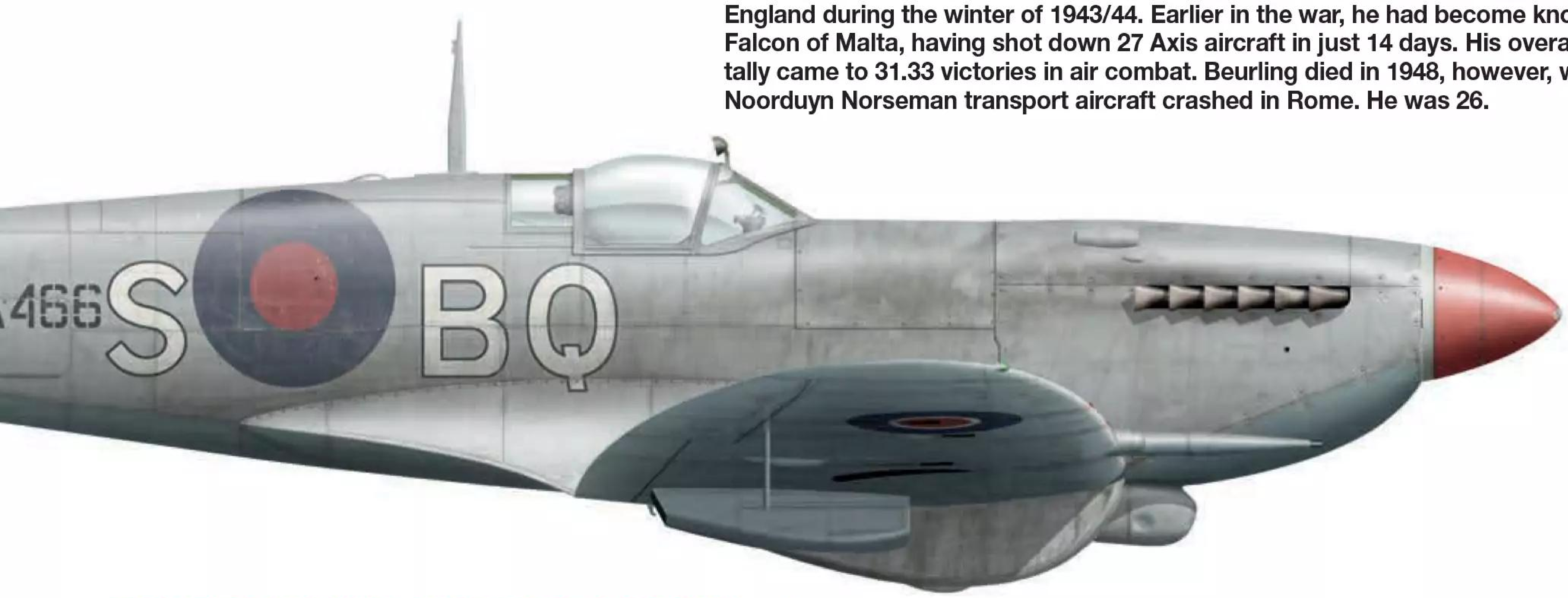
## SUPERMARINE SPITFIRE MK.IXC ◄

Flight Lieutenant Desmond Ibbotson of 601 Squadron, based at Perugis, Italy, flew this machine during July 1944. Four months later, on November 19, 1944, Ibbotson's Spitfire crashed into the ground for reasons unknown. The force of the crash buried parts of the aircraft up to 8m below the surface and Ibbotson's body lay undiscovered for 61 years until his final resting place was discovered by a group of Italian hobbyists. He was laid to rest at last in 2005.



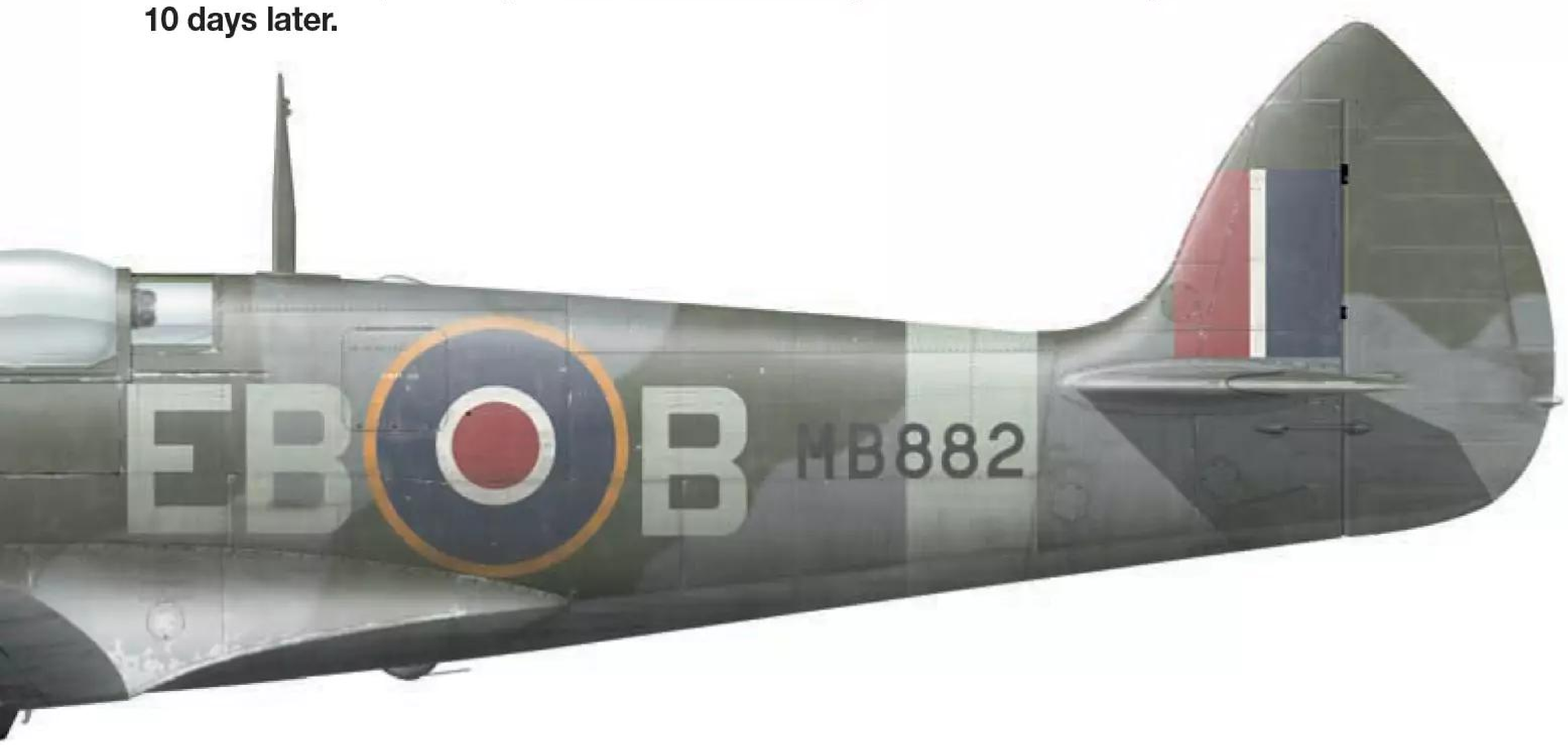
## SUPERMARINE SPITFIRE MK.IXC ▲

Canada's most successful fighter pilot of the war, Flight Lieutenant George 'Buzz' Beurling, flew this Spitfire with 412 (Canadian) Squadron, based at Biggin Hill in England during the winter of 1943/44. Earlier in the war, he had become known as The Falcon of Malta, having shot down 27 Axis aircraft in just 14 days. His overall wartime tally came to 31.33 victories in air combat. Beurling died in 1948, however, when his Noorduyn Norseman transport aircraft crashed in Rome. He was 26.



## SUPERMARINE SPITFIRE MK.IXC ▲

This Spitfire Mk.IXC was flown by Flight Lieutenant Wally Gale of 451 Squadron RAAF, stationed at Poretta in Italy during May 1944. Gale was promoted to squadron leader on July 3, 1944, and made commanding officer of 451 Sqn on July 7 but was killed during a mission over Italy 10 days later.

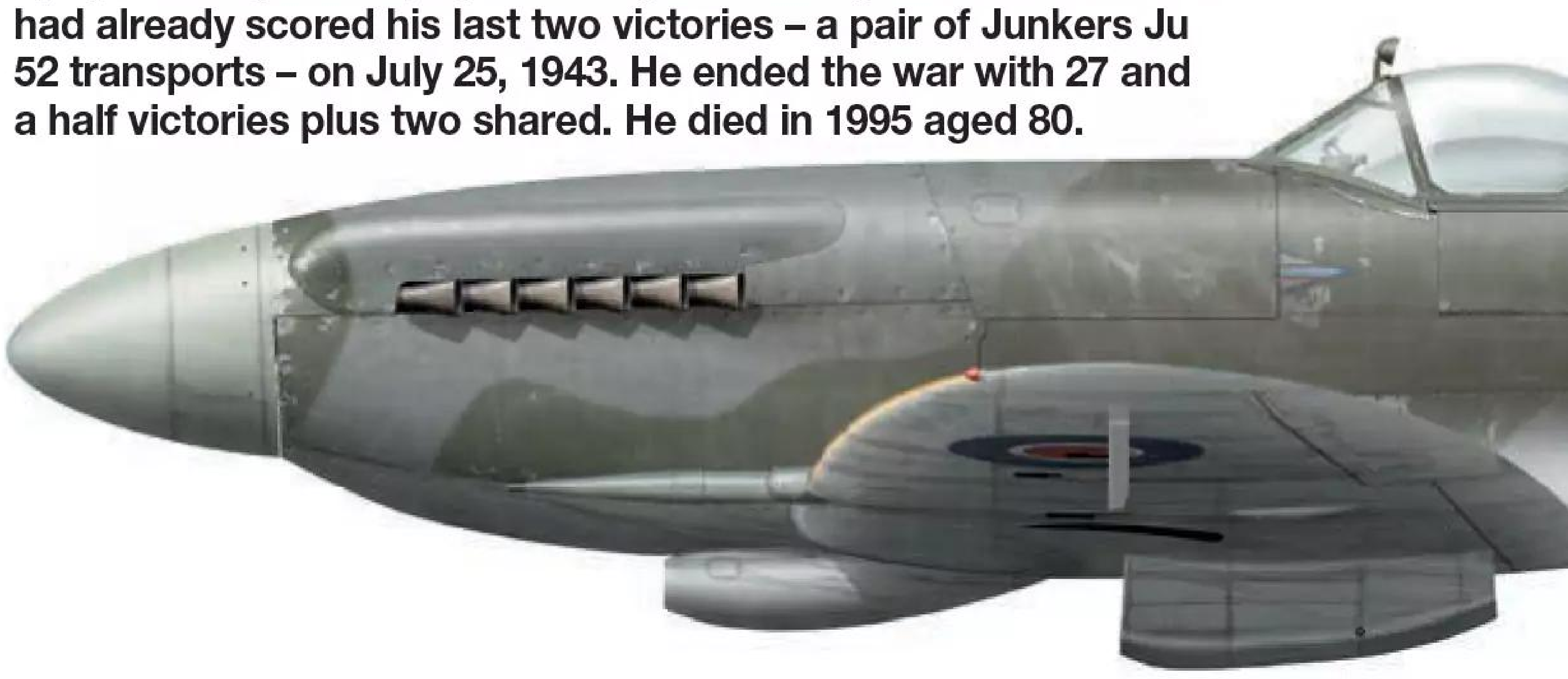


## SUPERMARINE SPITFIRE MK.XII ◄

Flight Lieutenant Donald H Smith of 41 Squadron, based Friston in England, flew this Spitfire Mk.XII during April 1944. He scored five victories in air combat plus two shared. Earlier in the war, Smith, an Australian, had served with 452 Squadron during the defence of Malta. Unusually, he was given the Russian Medal of Valour, despite never having served in Russia. Evidently the Russians supplied a block of medals to be allocated as the British saw fit. Most went to Royal Navy personnel but Smith was seen as worthy of an accolade so he duly received the medal.

## SUPERMARINE SPITFIRE MK.XIV ▼

**The top New Zealand fighter ace of the Second World War was Wing Commander Colin F Gray. He flew this aircraft with the Lympne Wing from Lympne in England during October 1944 but had already scored his last two victories – a pair of Junkers Ju 52 transports – on July 25, 1943. He ended the war with 27 and a half victories plus two shared. He died in 1995 aged 80.**



It was therefore decided that Mk.VC airframes should be modified to take the Merlin 61, resulting in the Mk.IX. Full production of bespoke Mk.IXs then commenced.

During early 1943, the Merlin 61 was replaced with the improved Merlin 63 and 63A. In the latter half of 1943 these too were superseded by the 1720hp Merlin 66. The Merlin 66-powered LF Mk.IX, with a top speed of 404mph at 21,000ft, became the workhorse of the RAF's fighter squadrons from its introduction through to the end of the war.

Compared against a captured Bf 109G-6/U2 with GM-1 nitrous oxide injection by the Central Fighter Establishment in late 1944, the LF Mk.IX was found to be superior in every respect except acceleration in a dive. Manoeuvrability was found to be "greatly superior" and it was noted that the LF.IX "easily out-turns the Bf 109 in either direction at all speeds". Even by the end of the war, it could still out-climb and fly higher than most of its opponents, out-performing many of the most advanced German piston-engined types.

**JUST 100 SPITFIRE MK.XIIS WERE MADE AND THEY WERE RETIRED IN SEPTEMBER 1944**

In early 1944, LF Mk.IXs were fitted with a new Mark II Gyro gunsight which calculated the correct angle of deflection to use when leading a target, hugely increasing the accuracy of RAF pilots' fire.

Late production models featured a new 'bulged' upper engine cowling and very late models had a cut-down rear fuselage and bubble canopy for improved visibility.

A grand total of 5656 Mk.IXs were made, with production only ending in April 1945. It was the most produced of all Spitfire marks.

The Spitfire Mk.XVI was identical to the Mk.IX except for the fact that its engine, the Merlin 266, was a licence-built version of the Merlin 66 produced by Packard in America. A total of 1054 Spitfire Mk.XVIs were built at Castle Bromwich.

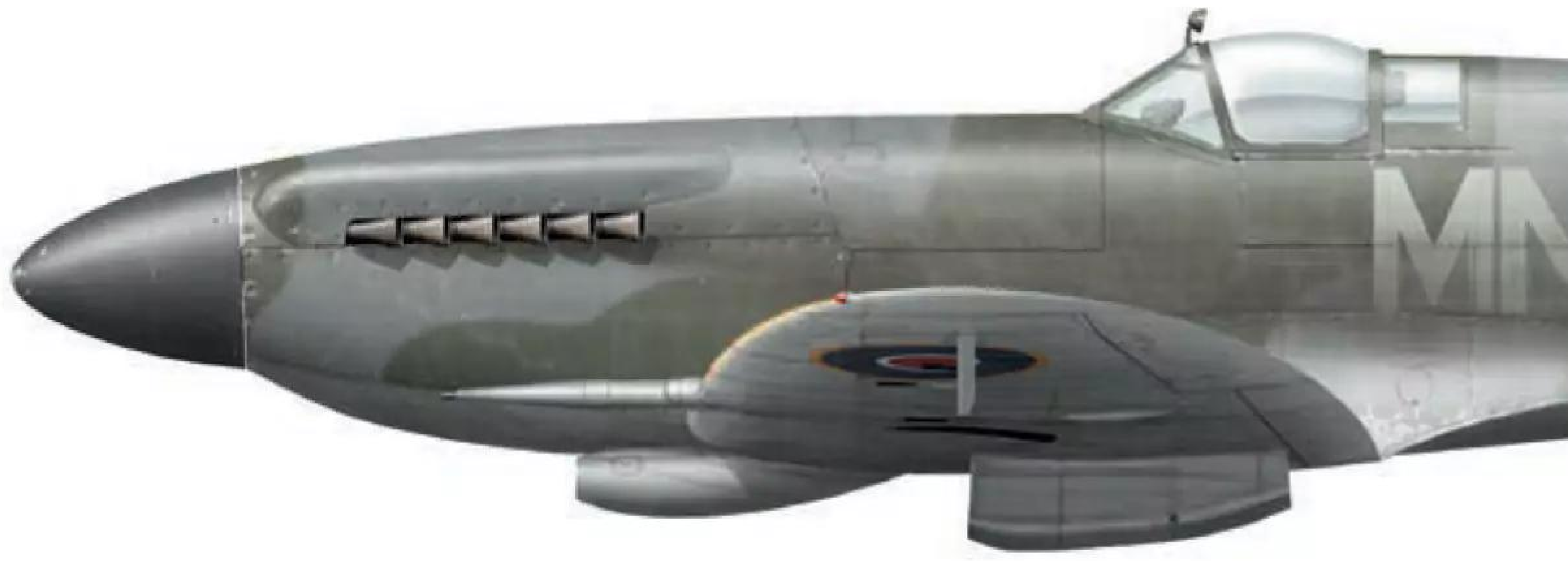
### SPITFIRE MK.XII

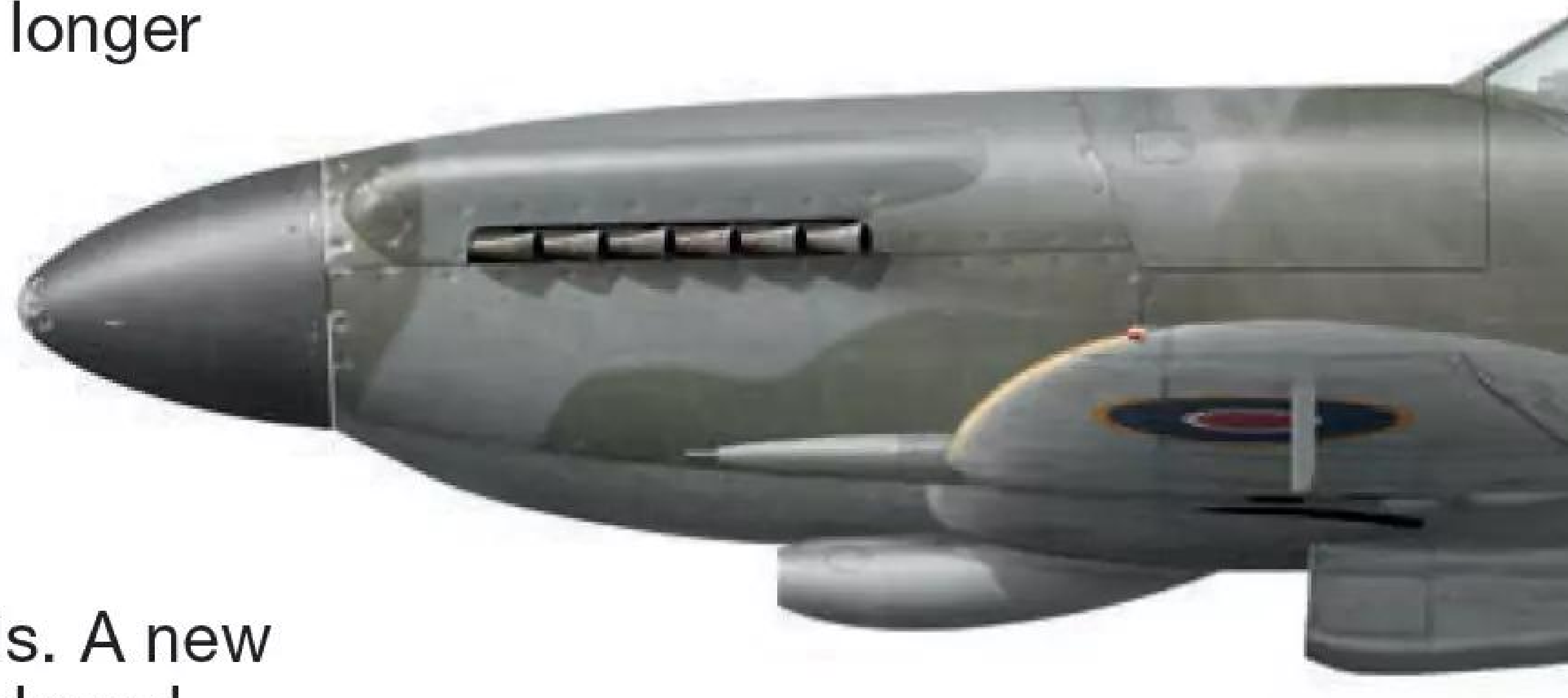
The Spitfire Mk.X and Mk.XI were both photo-reconnaissance versions and therefore fall outside the scope of this study. The Mk.XII, on the other hand, was the first Rolls-Royce Griffon-engined variant to enter full production. They were initially built using Mk.VC airframes and had fixed tail-wheels with longer pointed-tip rudders.

Part-way through, production switched to using Mk.VIII airframes though with the longer rudder and retractable tail-wheels. A new type of IFF was introduced, with the older tailplane aerials being replaced by a rod aerial protruding from the underside of the starboard wing. In addition, the Mk.XII was given a flush-riveted finish which was later rolled out across all Spitfires. All Mk.XIIs had clipped wings and only 100 were made, those that survived being retired from service in September 1944.

### SPITFIRE MK.XIV

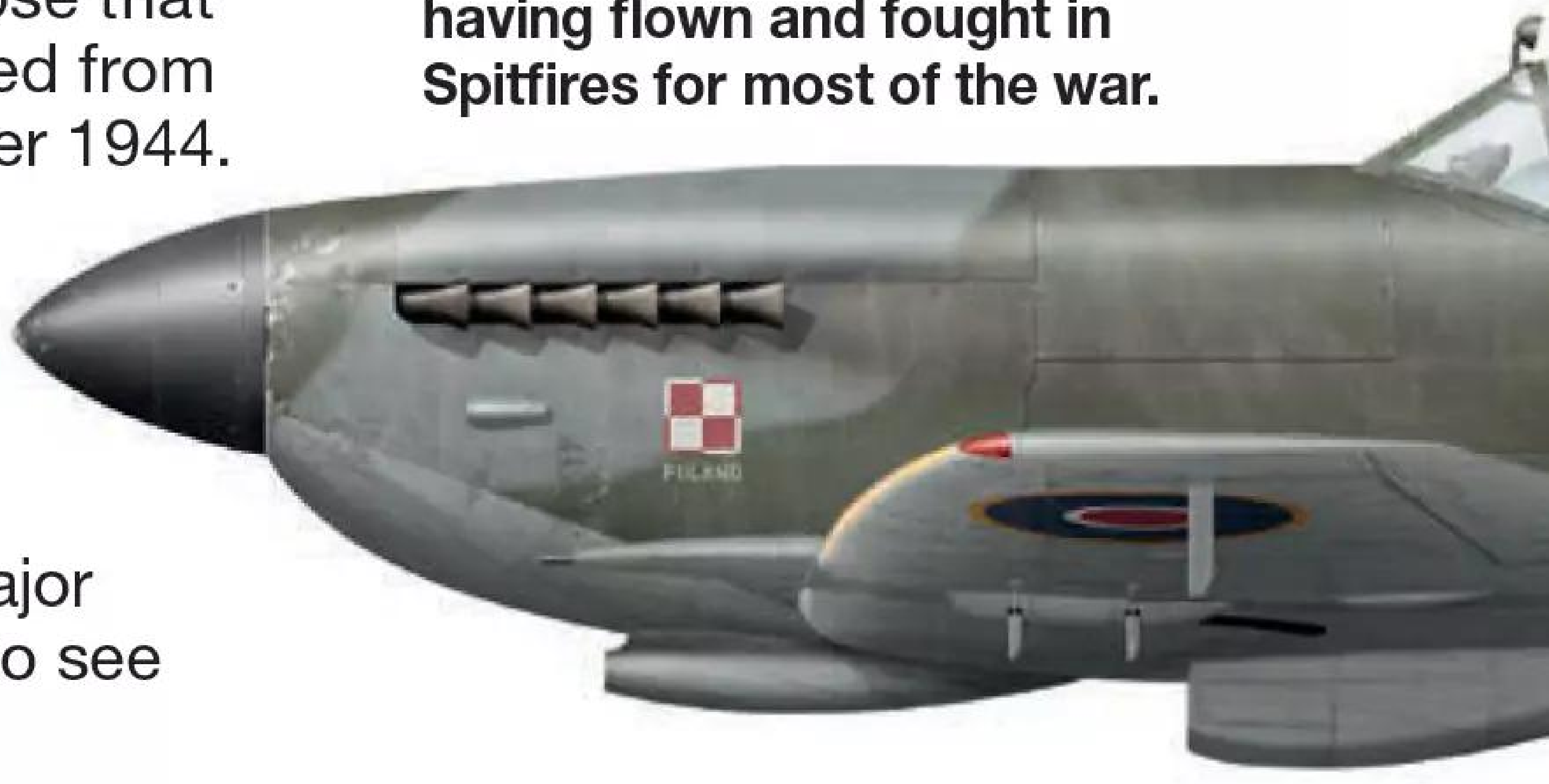
The Spitfire Mk.XIV (Supermarine Type 379) was the last major production version to see

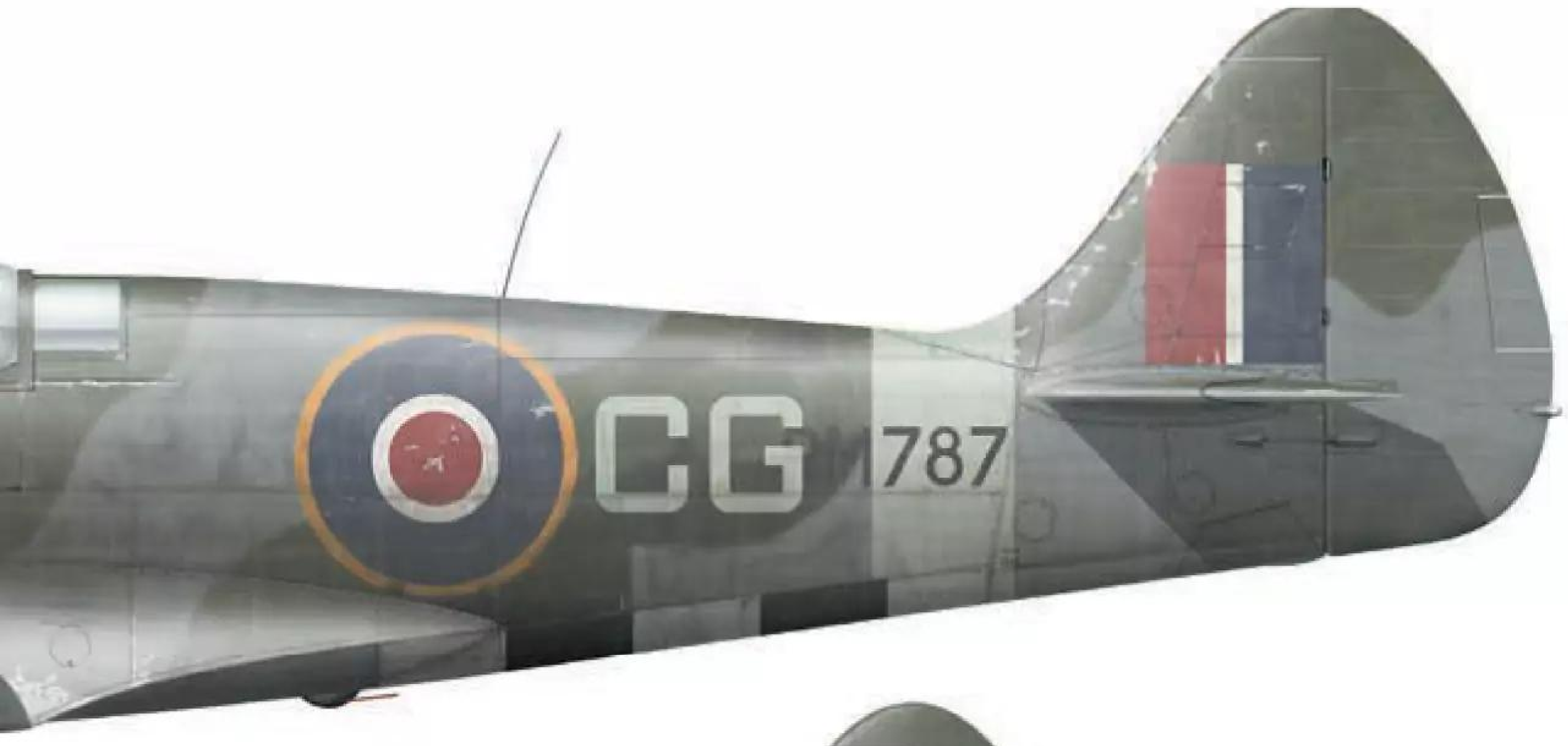


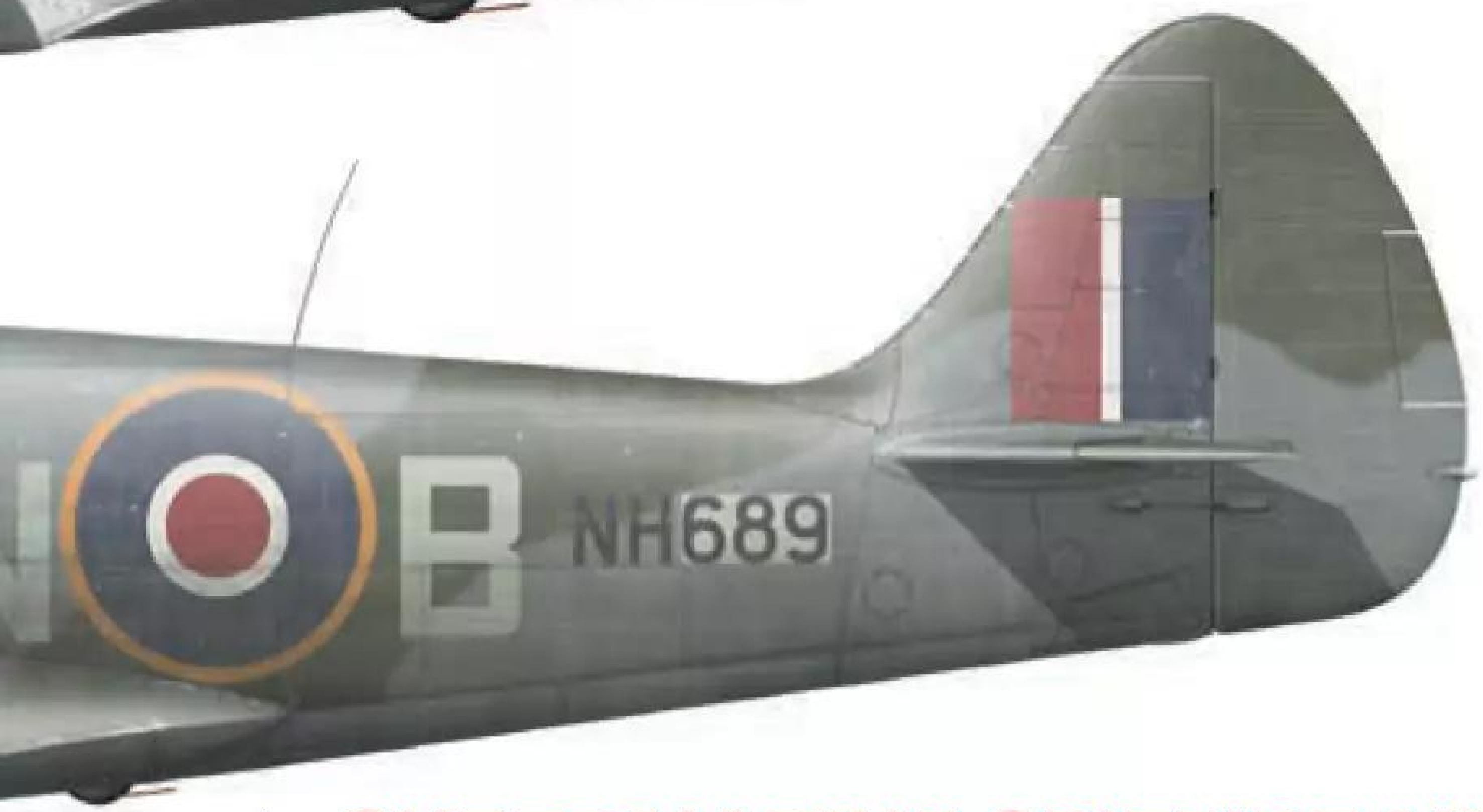


## SUPERMARINE SPITFIRE MK.XVIE ▼

**Wing Commander Tadeusz Sawicz was the last surviving Polish Battle of Britain pilot at the time of his death, aged 97, in 2011. He flew this Spitfire Mk.XIV with 131 (Polish) Wing, based at Varrelbusch in Germany during April 1945, having flown and fought in Spitfires for most of the war.**

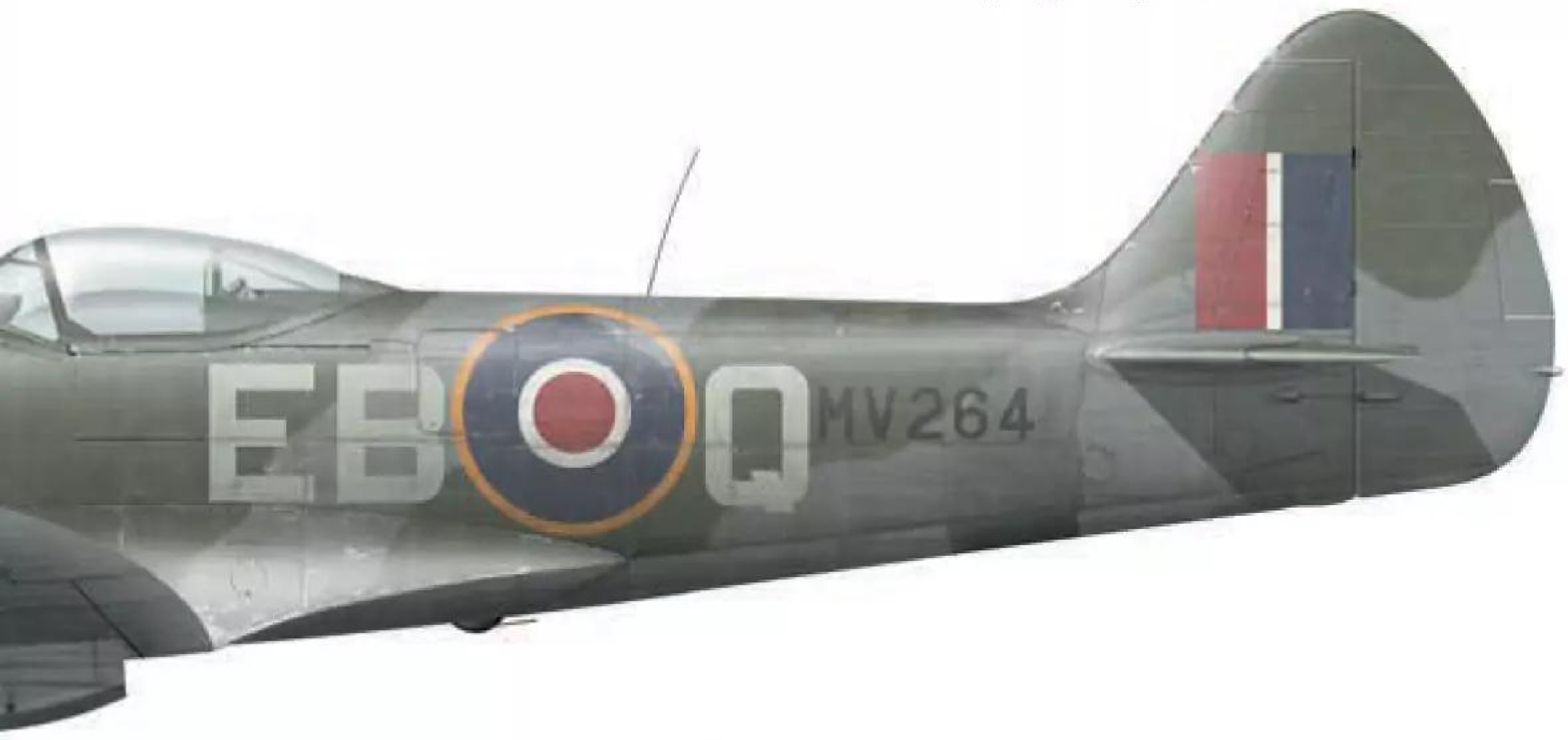






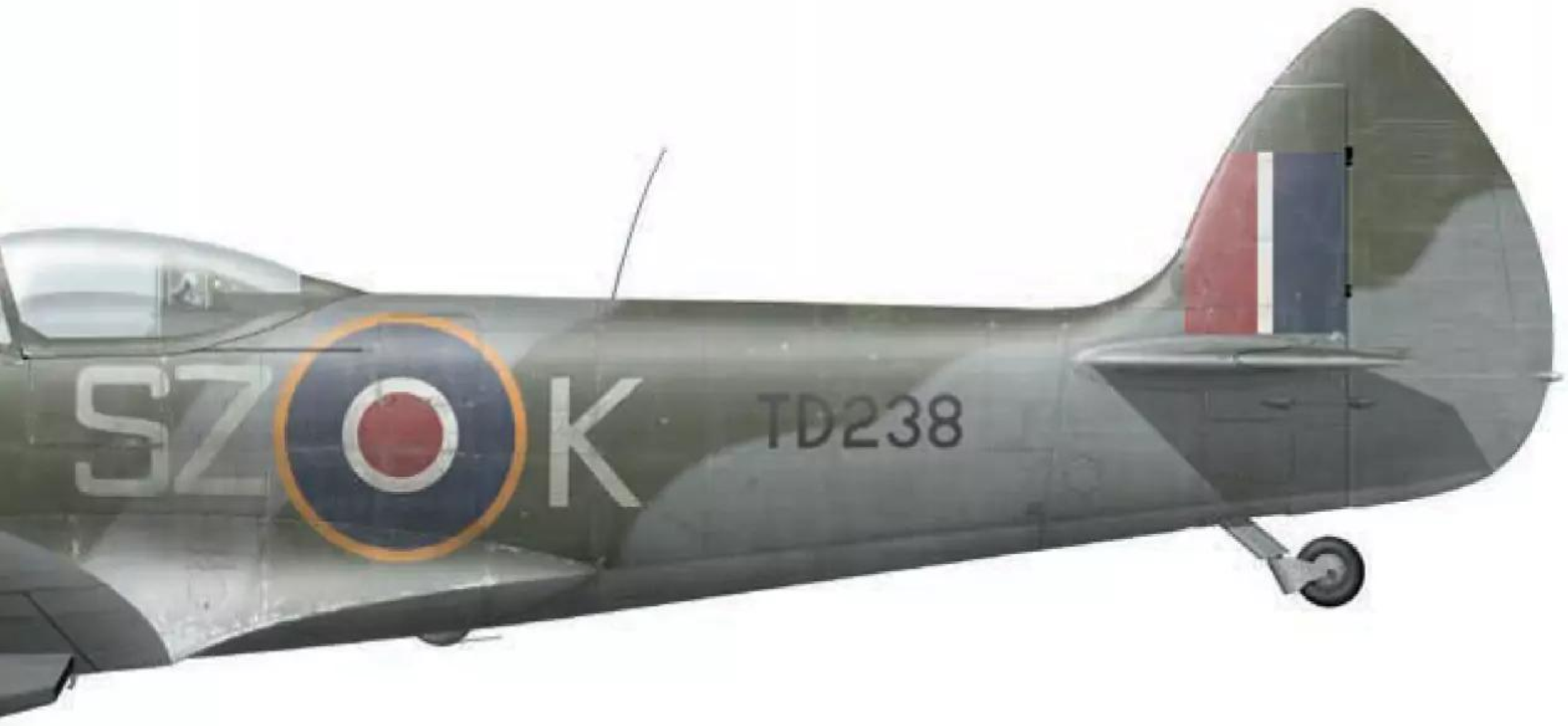
## ▲ SUPERMARINE SPITFIRE MK.XIVC

**Having escaped from occupied Belgium to Spain on July 11, 1941, Guy F 'Keke' Gigot was arrested by the Spanish authorities and held prisoner until his release in March 1942. He then made his way to Britain via Portugal and enlisted in the RAFVR. Following months of pilot training and postings to second line units he joined 350 (Belgian) Squadron on July 27, 1944. Stationed at Celle in Germany during late April 1945, he shot down two Fw 190s and shared in two others flying a Spitfire Mk.XIV.**



## SUPERMARINE SPITFIRE MK.XIVE ▲

**Just a week from the end of the Second World War in Europe, on May 1, 1945, Flying Officer Eric 'Ricky' Gray of 41 Squadron stationed at Celle, Germany, flew this Spitfire Mk.XIV. Gray achieved four victories in aerial combat plus one shared.**



combat during the Second World War, the Mk.XIII having been another photo-reconnaissance variant.

The Mk.XII had been powered by the Griffon III or IV, which had only a single-stage supercharger, blunting high-altitude performance. Rolls-Royce therefore worked to improve the Griffon by introducing a two-stage unit. The result, via the Mk.61 series, was the lengthy Griffon 65 and this was installed in the Spitfire Mk.XIV. It produced 2050hp and had to be mounted 10in further forward in the airframe. Its ejector exhaust stubs were of circular section and due to the massive powerplant's cooling needs all its radiators had to be significantly enlarged, with deeper underwing housings that those of any previous Spitfire. It drove a large five-bladed Rotol propeller.

A bigger oil tank – containing 10 gallons rather than six – was required and at the rear of the aircraft a new tail unit was installed to help provide balance. This featured a new taller and much broader fin and larger rudder. During early tests, the new design managed an incredible 445mph at 25,000ft and a climb rate of more than 5000ft per minute.

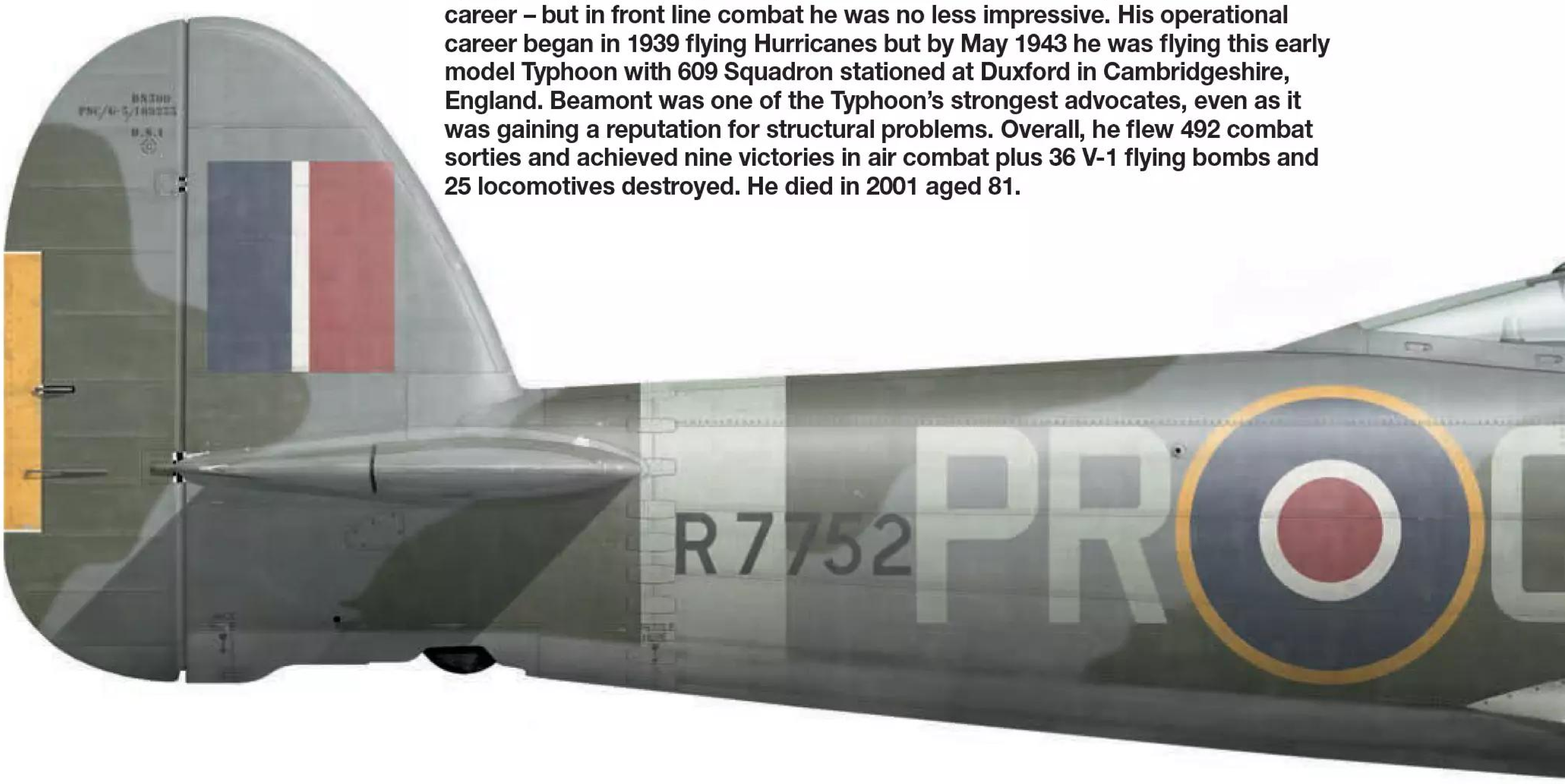
The only problem was range. With 109.5 gallons in two main tanks and a tank in the leading edge of each wing, it could manage just over 460 miles. The first production Mk.XIV was rolled out in October 1943 and by late 1944 production types were being fitted with an additional rear fuselage tank, taking range to 850 miles with the further addition of a 90 gallon drop tank.

Later versions of the Spitfire Mk.XIV had the rear fuselage cut back and a bubble canopy installed. Towards the end of 1944, 150 octane fuel was introduced which served to further increase the Mk.XIV's already superior top speed. The Mk.XIVE could manage 449mph at 24,500ft.

All together, 957 Mk.XIVs were built. ●

### HAWKER TYPHOON MK.IB

**The postwar fame of Squadron Leader Roland 'Bee' Beamont as a test pilot flying the Canberra, Lightning and TSR2 has tended to eclipse his wartime career – but in front line combat he was no less impressive. His operational career began in 1939 flying Hurricanes but by May 1943 he was flying this early model Typhoon with 609 Squadron stationed at Duxford in Cambridgeshire, England. Beamont was one of the Typhoon's strongest advocates, even as it was gaining a reputation for structural problems. Overall, he flew 492 combat sorties and achieved nine victories in air combat plus 36 V-1 flying bombs and 25 locomotives destroyed. He died in 2001 aged 81.**



# HAWKER TYPHOON

**Striking fear into the hearts of German tank crews as the archetypal rocket-firing 'jabo' earned the Typhoon its place in history. It was anything but an overnight success, however.**

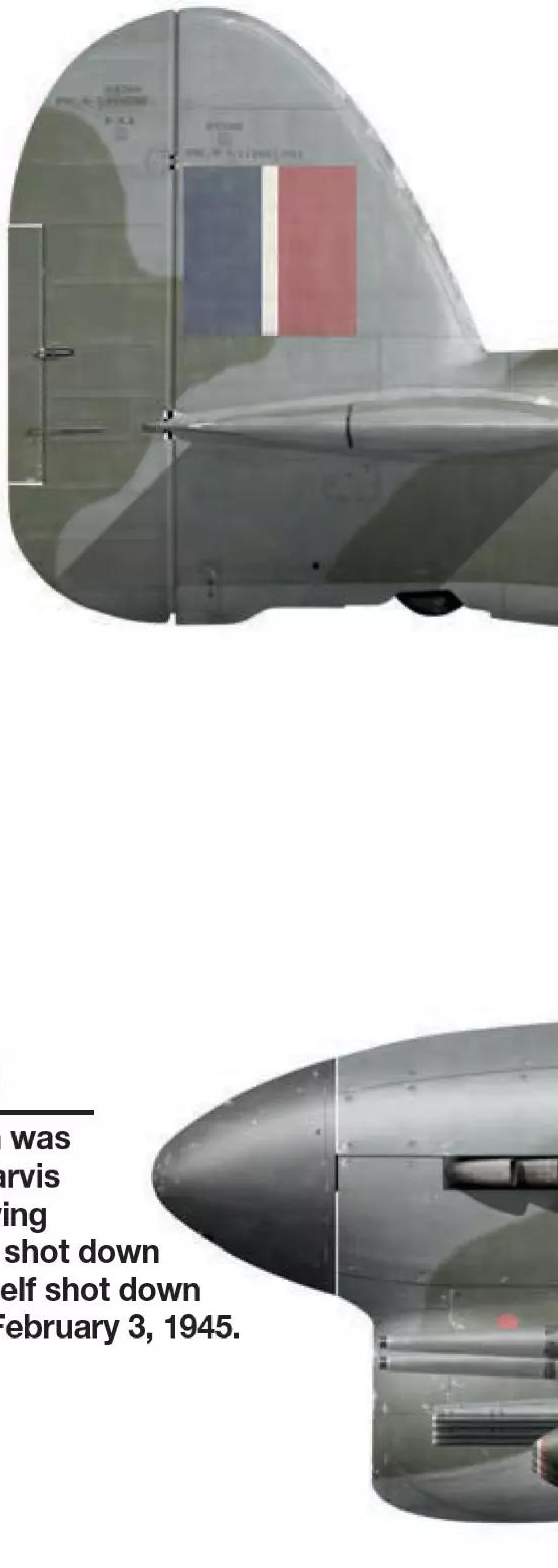
Once an order had been placed for the Hurricane, though before it had reached full production, Hawker chief designer Sydney Camm and his team began work on its successor. It was uncertain at this stage, however, which of the new 2000hp 24-cylinder engines then in development would be available to power the new fighter.

Hawker therefore worked up two designs in parallel during 1937 – one to be fitted with the Rolls-Royce Vulture and the other the Napier Sabre. An Air Ministry specification, F.18/37, was issued in March 1938 which outlined a fighter capable of 400mph at 15,000ft powered by a British engine with a two-speed supercharger. It was to have 12 Browning machine guns with 500 rounds per gun but had to be capable of accepting alternative weapon loads.

Hawker was well prepared for this. The first engine to reach a state of readiness was the Vulture – which meant that the Hawker design intended for this, the Tornado, was built and flew first, on October 6, 1939. The Sabre design, the Typhoon, was not ready for its maiden flight until February 24, 1940, due to delays in completing its engine.

### HAWKER TYPHOON MK.IB

**During June 1944 this rocket-armed Typhoon was flown by Flight Lieutenant Eric H A Vernon-Jarvis of 175 Squadron from St Croix in France. Having achieved one victory in air combat – a Bf 109 shot down on January 22, 1945, Vernon-Jarvis was himself shot down and killed by German flak near Dorenthe on February 3, 1945.**

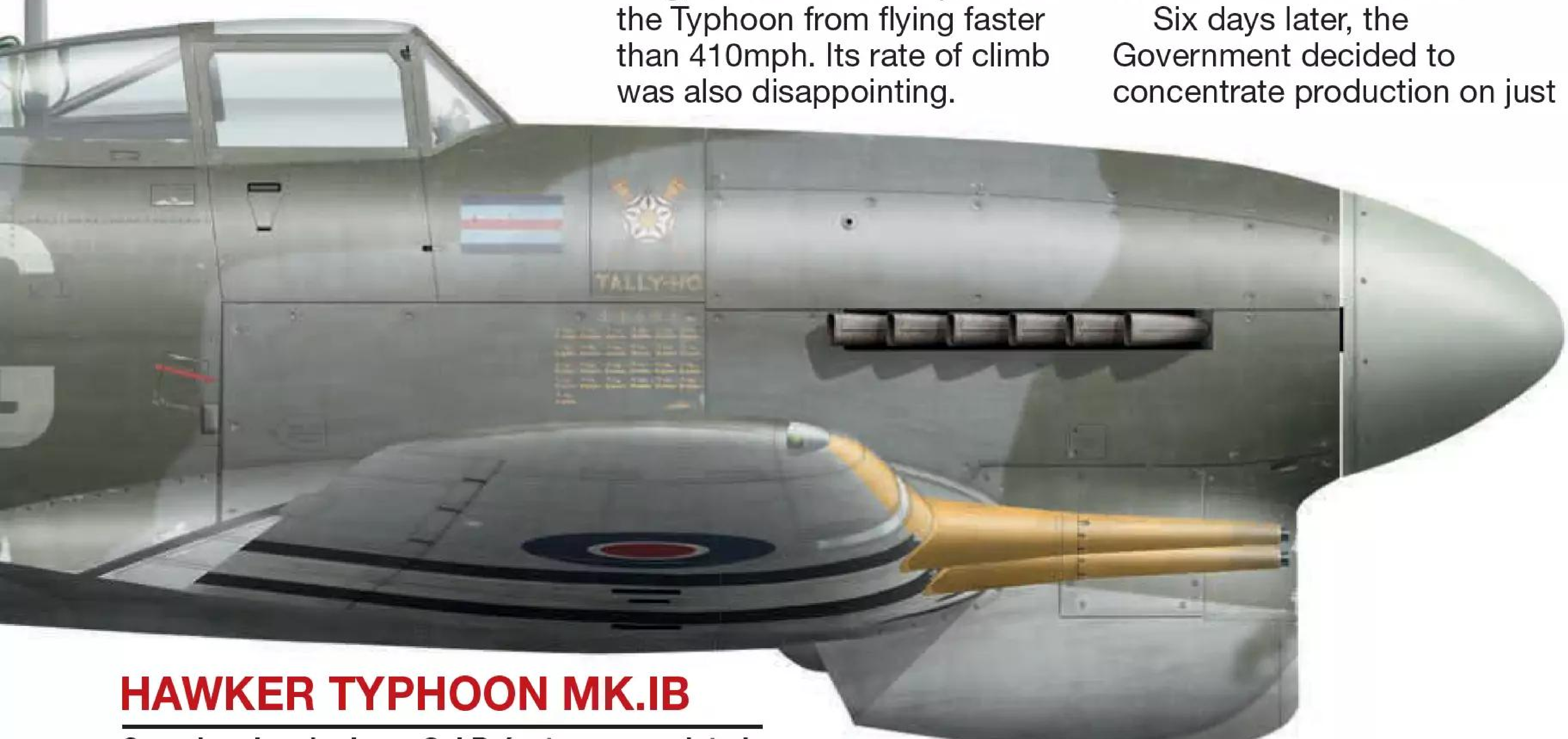


While the Typhoon was similar in size to the Hurricane, being slightly shorter in the fuselage but slightly longer in wingspan, it was built differently. The forward fuselage was made of bolted and welded duralumin or steel tubes covered with skin panels. The rear portion, aft of the cockpit, was a semi-monocoque structure.

The thick 41ft 7in span wings had a slight gullwing bend and were extremely strong with sufficient space for fuel tanks, heavy weapons and the inward-retracting landing gear. A side effect of these capacious wings was high drag, which served to prevent the Typhoon from flying faster than 410mph. Its rate of climb was also disappointing.

After some uneventful early flights, the first prototype P5212 suffered a structural failure in mid-air during a test on May 9, 1940. A large crack appeared behind the pilot's seat at the point where the forward and rear fuselage sections were joined. The pilot, Philip Lucas, managed to land the aircraft nevertheless.

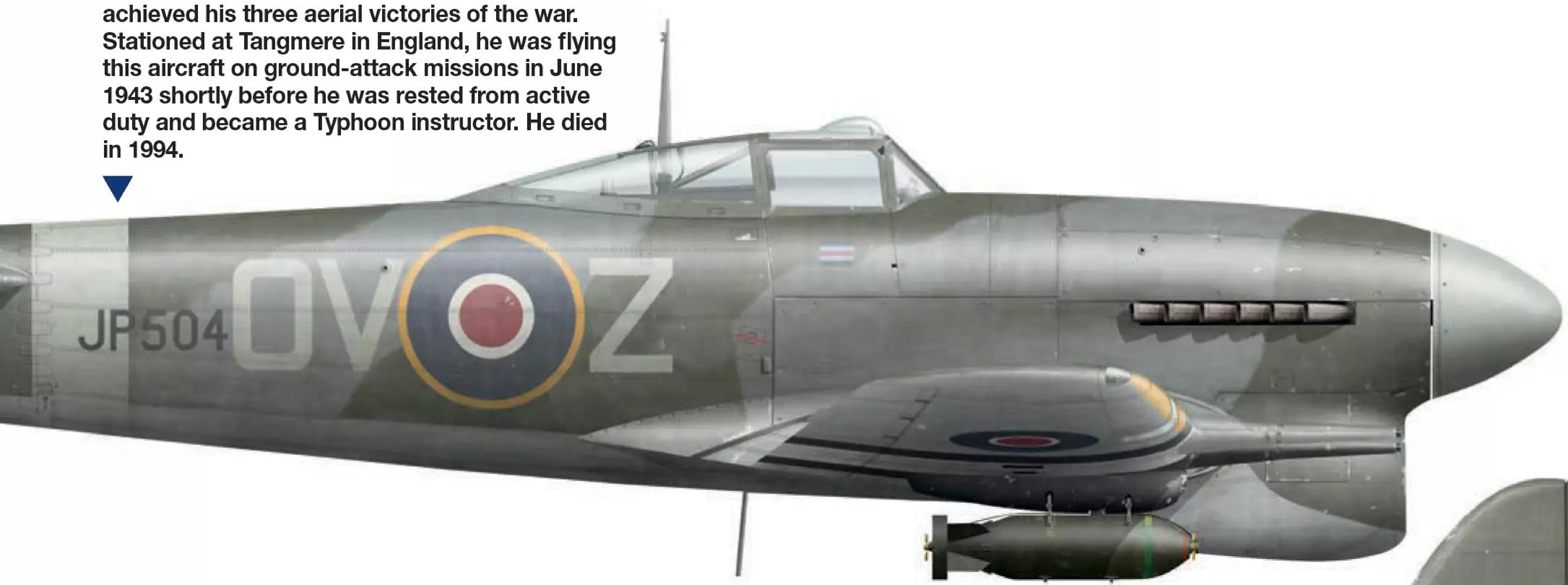
Six days later, the Government decided to concentrate production on just

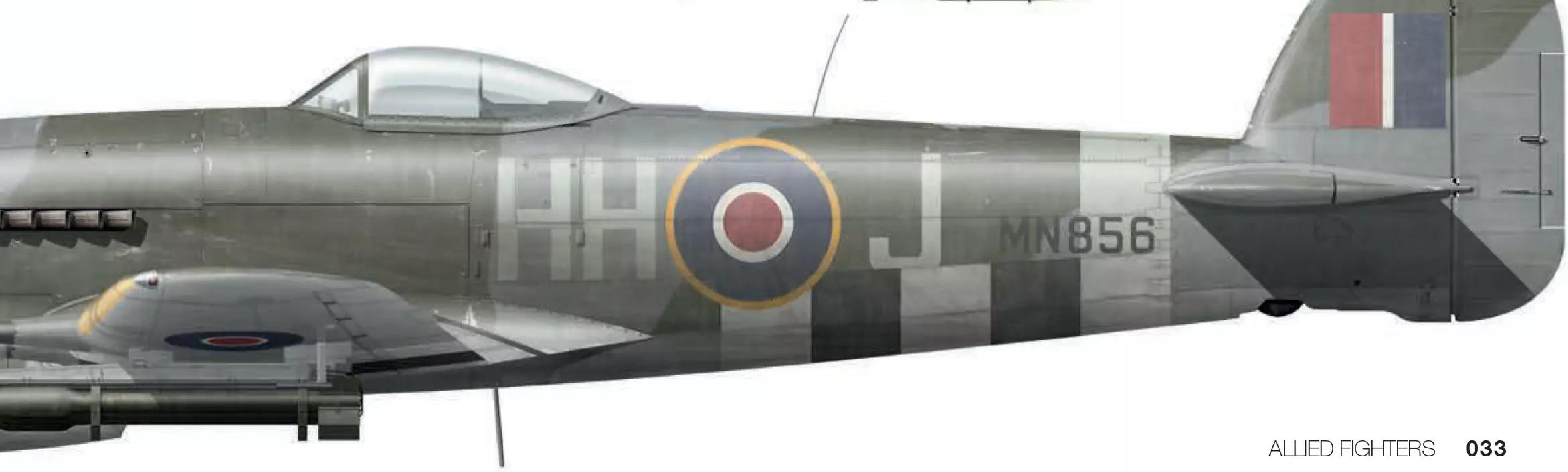


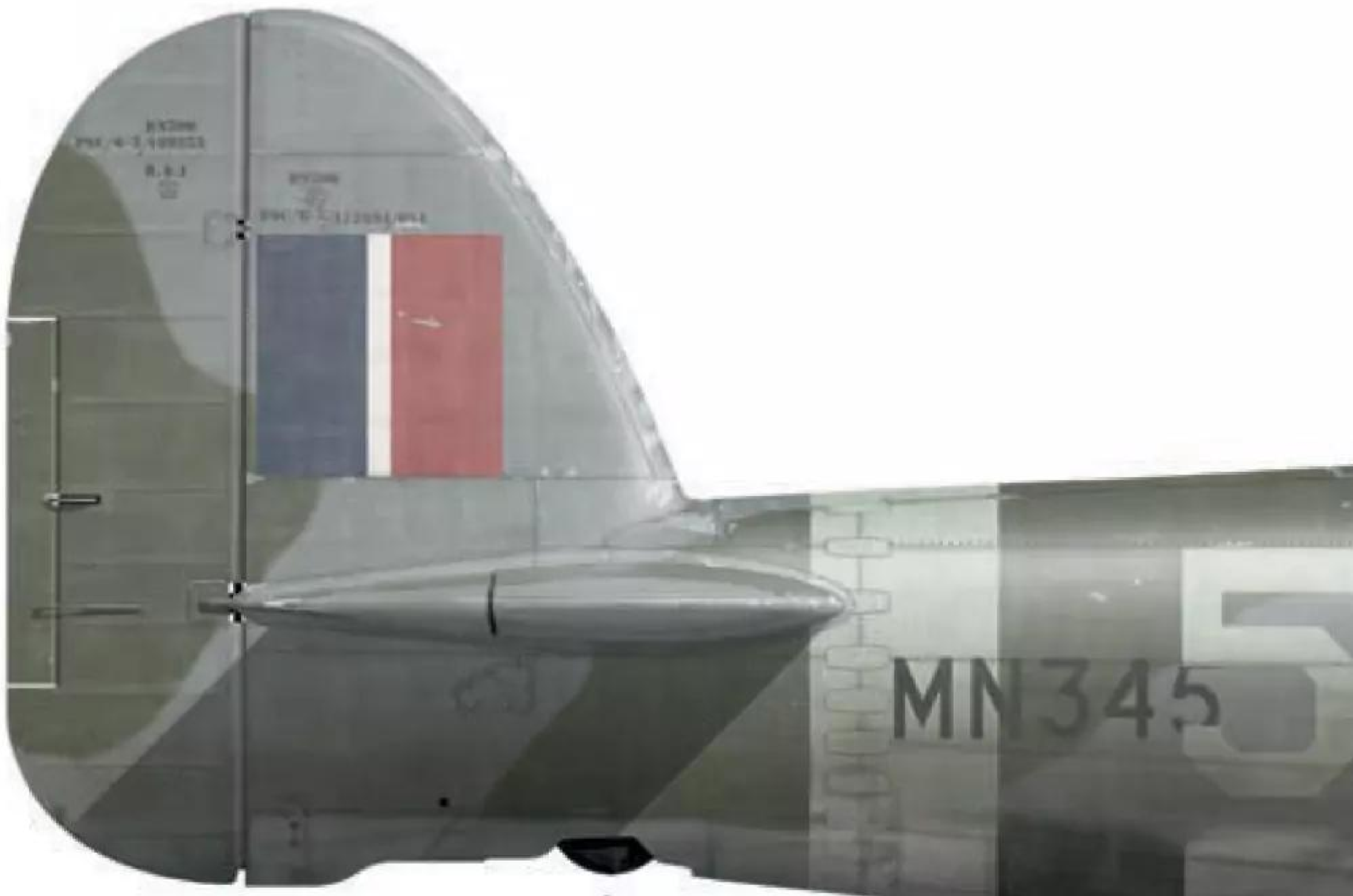
## HAWKER TYPHOON MK.IB

**Squadron Leader Leon O J Prévot was appointed the commander of newly formed Typhoon unit 197 Squadron on November 21, 1942, having already achieved his three aerial victories of the war. Stationed at Tangmere in England, he was flying this aircraft on ground-attack missions in June 1943 shortly before he was rested from active duty and became a Typhoon instructor. He died in 1994.**

▼

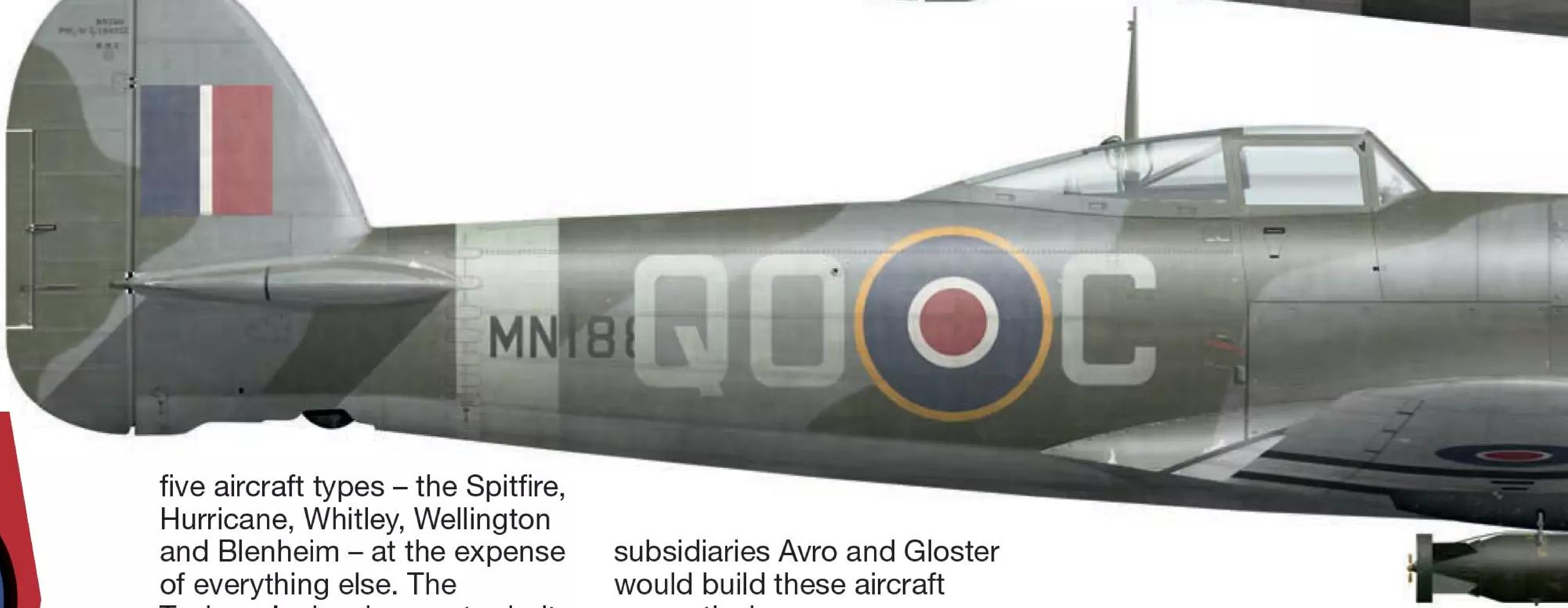






## HAWKER TYPHOON MK.IB ▼

**Scrambled to intercept a formation of B-26 medium bombers 5km north of Amiens, France, on March 6, 1944, JG 26 pilot Hauptmann Klaus Meitusch instead shot down one of the Typhoons escorting them. The aircraft was flown by Pilot Officer Charles A Tidy of 3 Squadron, based at Swanton Morley in England. Tidy not only managed to escape his stricken Typhoon but also evaded capture by the Germans on the ground until September when France was liberated and he was able to return to his unit. There is no known photo of Tidy's Typhoon so this profile is based on other Typhoons from his unit during this period.**



five aircraft types – the Spitfire, Hurricane, Whitley, Wellington and Blenheim – at the expense of everything else. The Typhoon's development priority was lowered and progress slowed. A second prototype was not flown until May 3, 1941, and in the meantime, armament had been changed to four 20mm Hispano Mk.II cannon with 140 rounds per gun. This aircraft, P5216, served as the prototype for the production model Typhoon Mark IB.

However, engine development had now progressed to a point where the Vulture seemed much more promising than the Sabre. As a result, Hawker was ordered to proceed with building 500 Tornados but only 250 Typhoons. Since Hawker itself was fully committed to Hurricane production, it was decided that Hawker subsidiaries Avro and Gloster would build these aircraft respectively.

Being less occupied with other work than Avro, Gloster managed to put together the first production Typhoon three weeks after the prototype had first flown – its first flight being on May 27, 1941. At the same time, it was becoming evident to Avro that the Rolls-Royce Vulture was significantly less reliable than expected. The Vulture was cancelled in July and with it the Tornado.

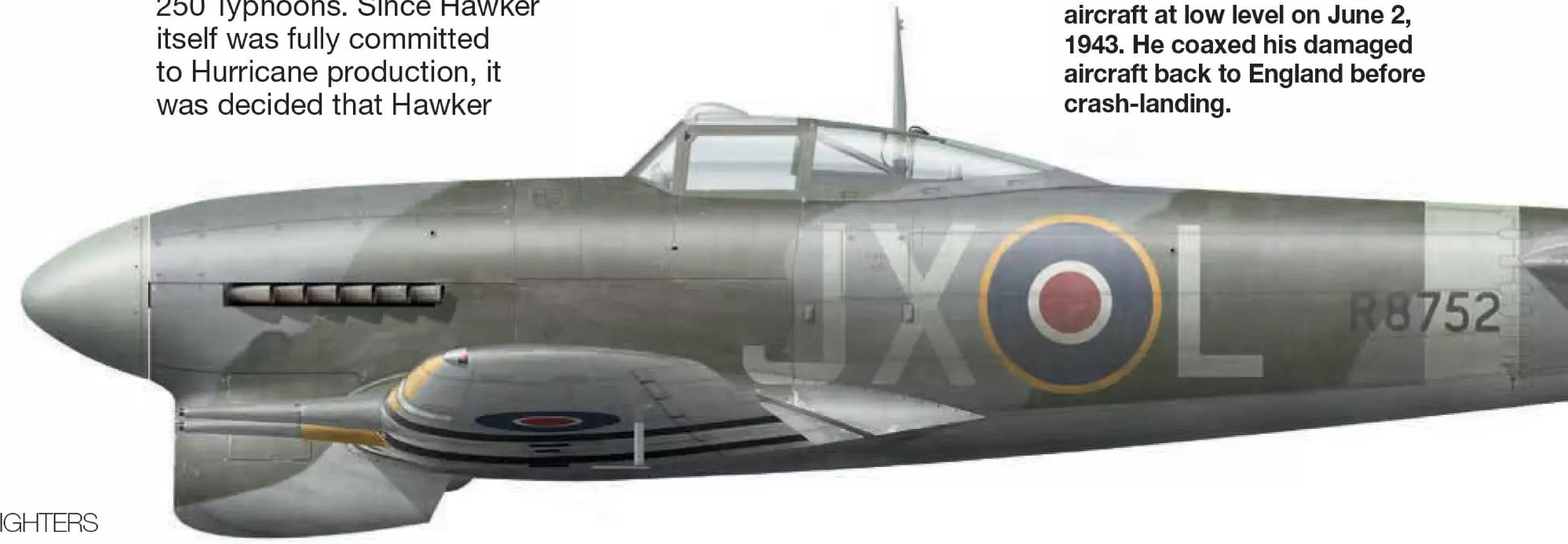
Typhoon production was rapidly stepped up and the first machines off the line were rushed into service with 56 and 609 Squadrons. Their role was to be that of interceptor, to

## HAWKER TYPHOON MK.IB ▶

**181 Squadron's commander, Sqn Ldr Denis Crowley-Milling flew this aircraft from Duxford, England, during spring 1943. He developed eyesight problems in October 1943 and was removed from operational flying. After the war he rose to the rank of air marshal. He died in 1996 aged 77.**

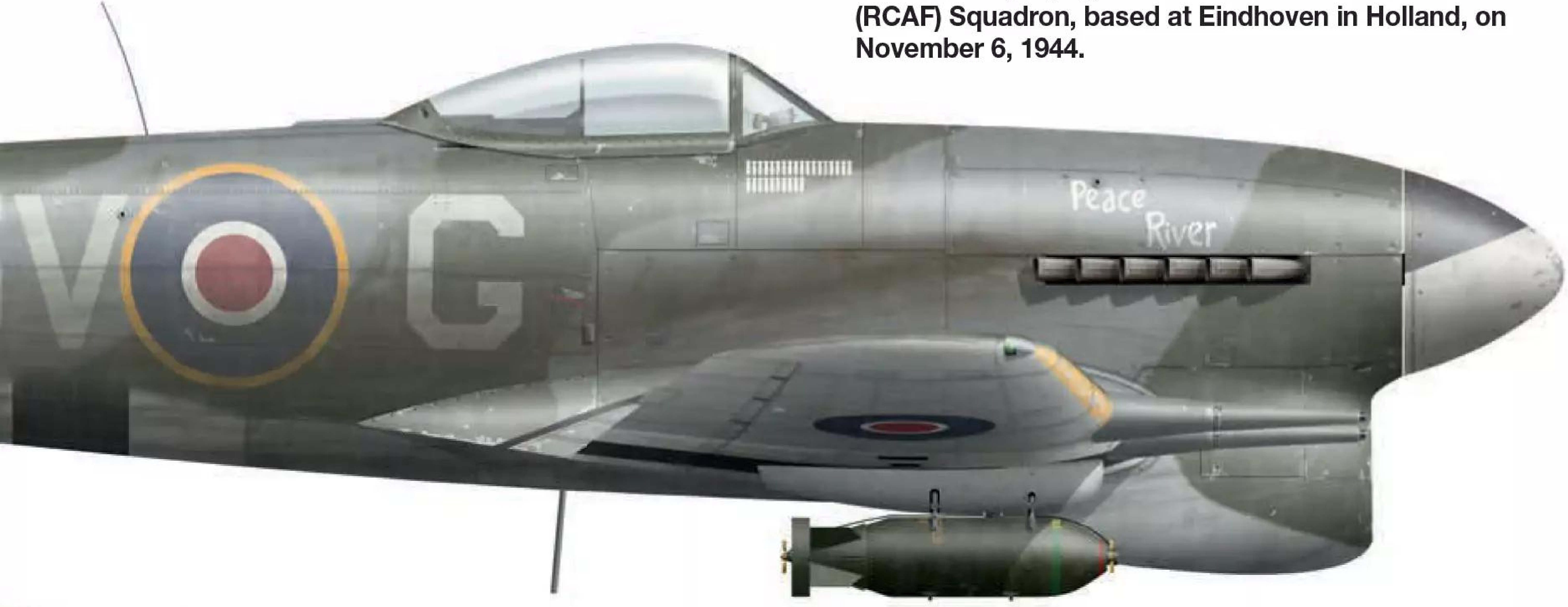
## HAWKER TYPHOON MK.IB ▼

**Flt Sgt W H Ramsey clipped a telegraph pole while flying this aircraft at low level on June 2, 1943. He coaxed his damaged aircraft back to England before crash-landing.**



## HAWKER TYPHOON MK.IB ▼

This Typhoon, MN345, nicknamed ‘Peace River’ was flown by Flying Officer James A Brown of 438 (RCAF) Squadron, based at Eindhoven in Holland, on November 6, 1944.



combat the new threat posed by the Focke-Wulf Fw 190.

Pilots soon discovered that the Typhoon was by no means a comfortable aircraft to fly. Carbon monoxide fumes tended to seep into the cockpit, necessitating the use of an oxygen mask at all times, even when taxiing on the ground. The huge Sabre engine also caused the cockpit to become stiflingly hot after prolonged use.

One unusual feature of the Typhoons was the ‘car doors’ which opened onto its cockpit in place of a conventional hinged or sliding canopy. They even had wind-down windows. There was also a dorsal fairing attached to the rear of the cockpit, which severely hampered rearward visibility.

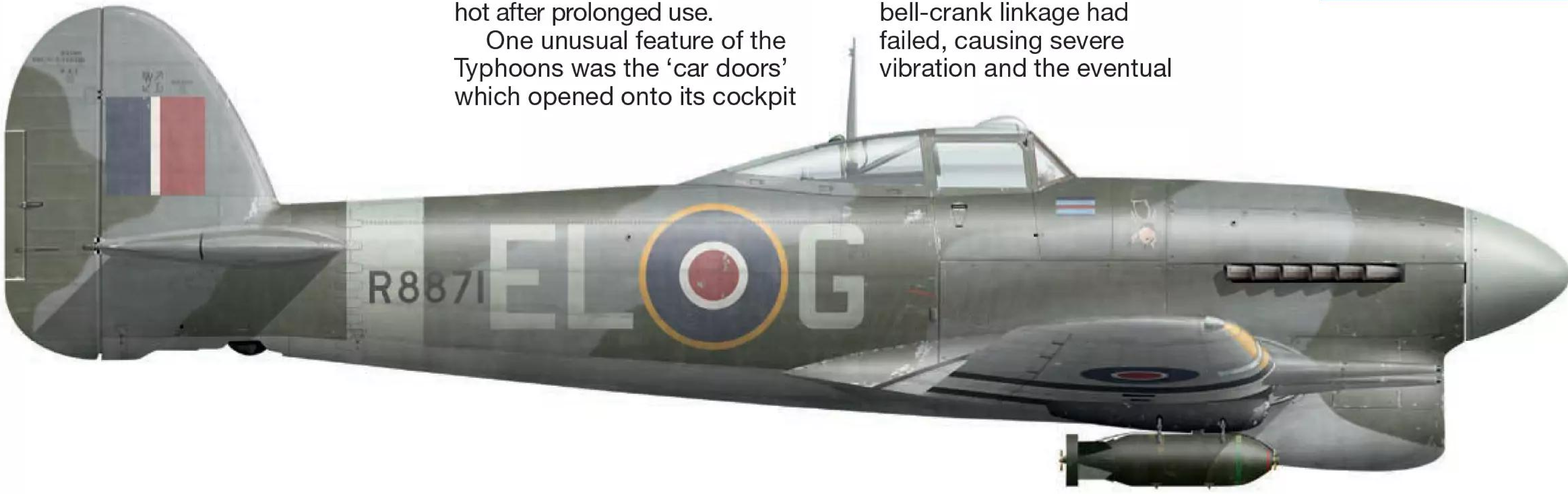
The aircraft’s greatest vice had yet to make itself known, however. Several Typhoons were lost in mysterious circumstances and questions began to be asked about the type’s airworthiness.

Then on August 11, 1942, Hawker test pilot Kenneth Seth-Smith was killed when his Typhoon R7692 broke apart and crashed during a straight and level test flight from Langley while over Thorpe in Surrey. The tailplane had detached mid-flight as a result of fatigue failure. An investigation determined that the elevator mass-balance bell-crank linkage had failed, causing severe vibration and the eventual catastrophic loss of the aircraft – an entirely different problem to that which had afflicted Lucas’s machine.

The fitment of reinforcing plates partially cured the problem but it was never wholly solved.

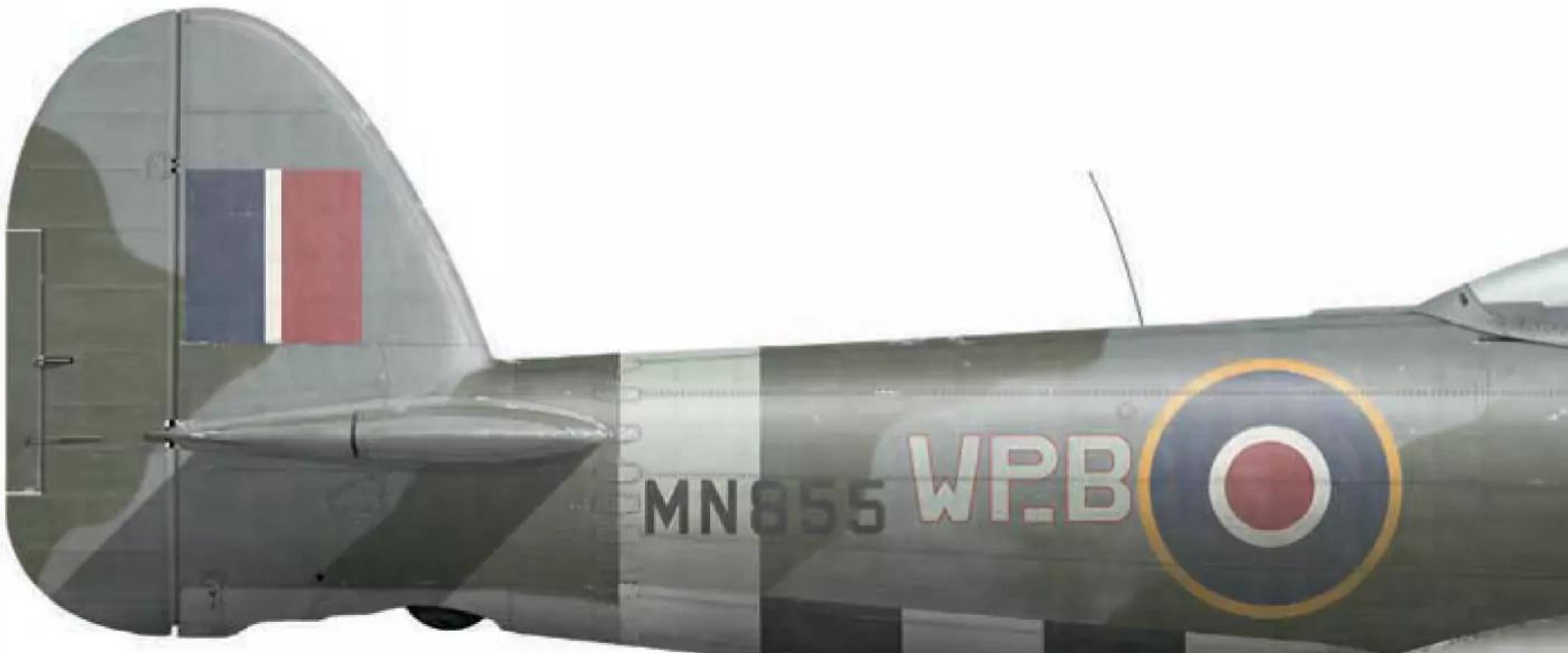
Longer exhaust stubs were fitted in an attempt to fix the CO2 problem in November 1941, and port cockpit doors were sealed over. In addition, a ventilation tube was installed

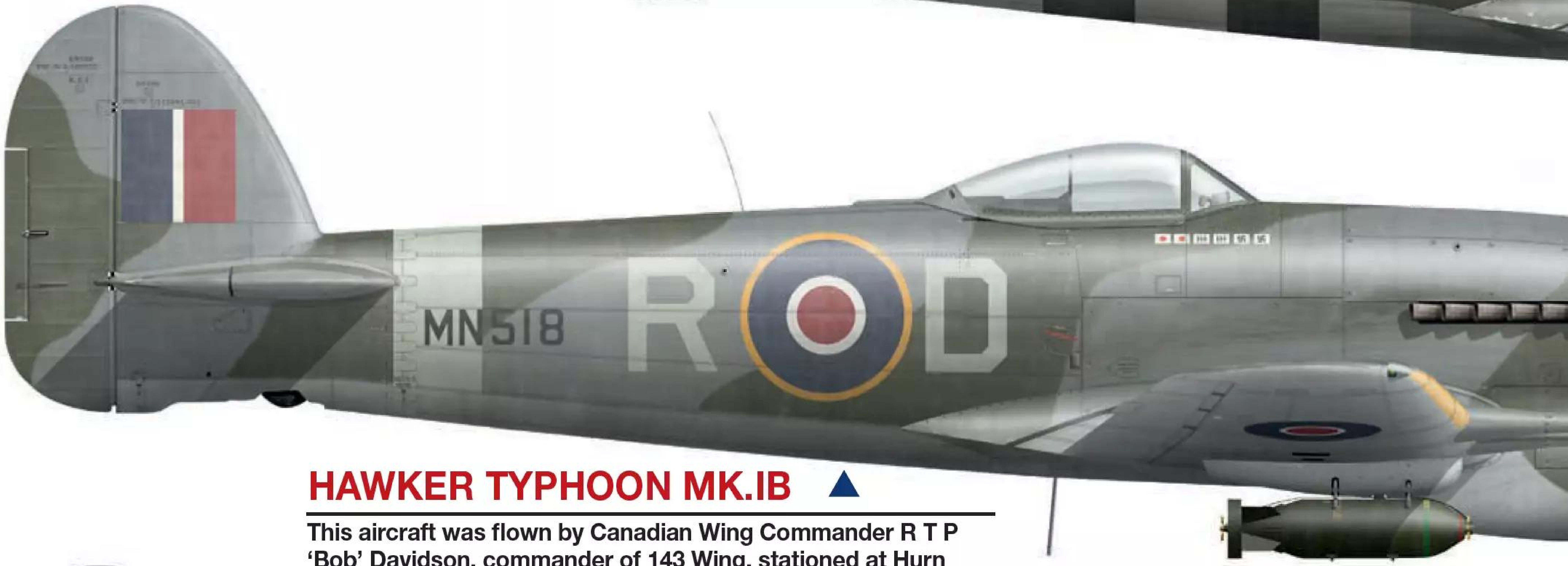
ENGINE FUMES LEAKED INTO THE TYPHOON’S COCKPIT AND IT GOT VERY HOT



## HAWKER TYPHOON MK.IB ▶

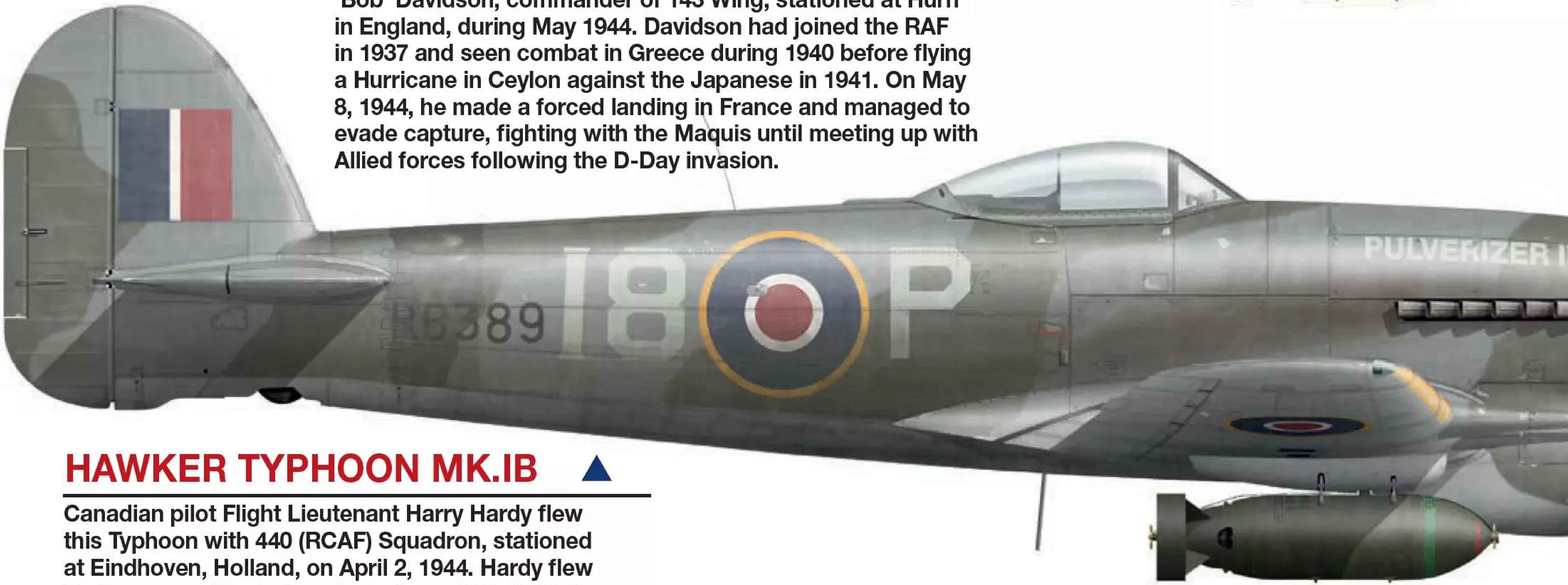
Wing Commander William Pitt-Brown started the war in India, flying Westland Wapiti and Vickers Valentia biplanes, before being posted to the Far East to fly Curtiss P-36 Mohawks in Assam against the Japanese. He returned to Britain in 1944 and led 174 Squadron throughout the Normandy invasion. In August he was made wing leader of 121 Wing and, stationed at Vitry-en-Artois, France, he flew this aircraft during September 1944. During a ground-attack mission over Belgium on the 10th he was hit by flak and bailed out. Later in the war, he served in the Far East once again as a Spitfire pilot.





## HAWKER TYPHOON MK.IB ▲

This aircraft was flown by Canadian Wing Commander R T P 'Bob' Davidson, commander of 143 Wing, stationed at Hurn in England, during May 1944. Davidson had joined the RAF in 1937 and seen combat in Greece during 1940 before flying a Hurricane in Ceylon against the Japanese in 1941. On May 8, 1944, he made a forced landing in France and managed to evade capture, fighting with the Maquis until meeting up with Allied forces following the D-Day invasion.

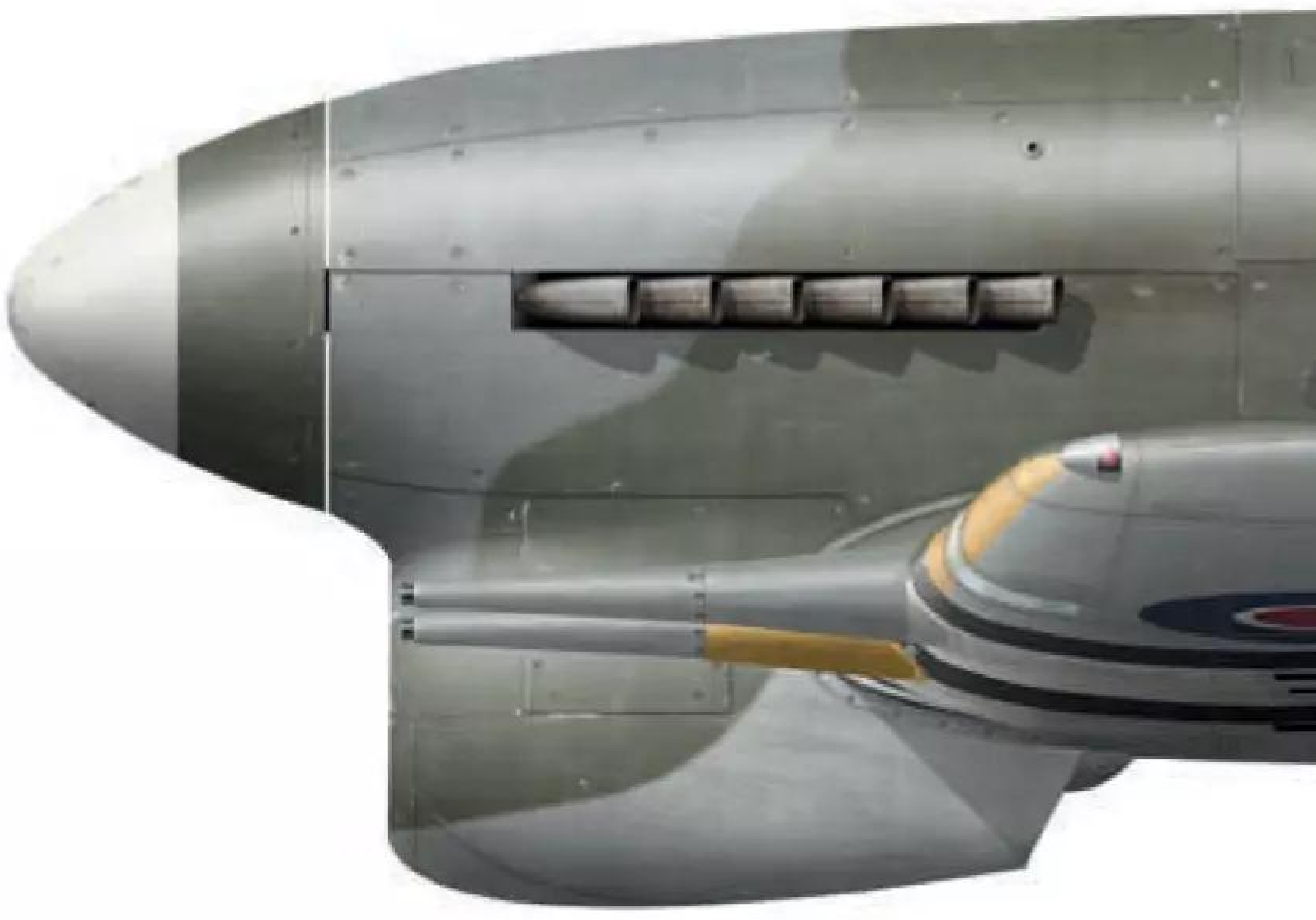


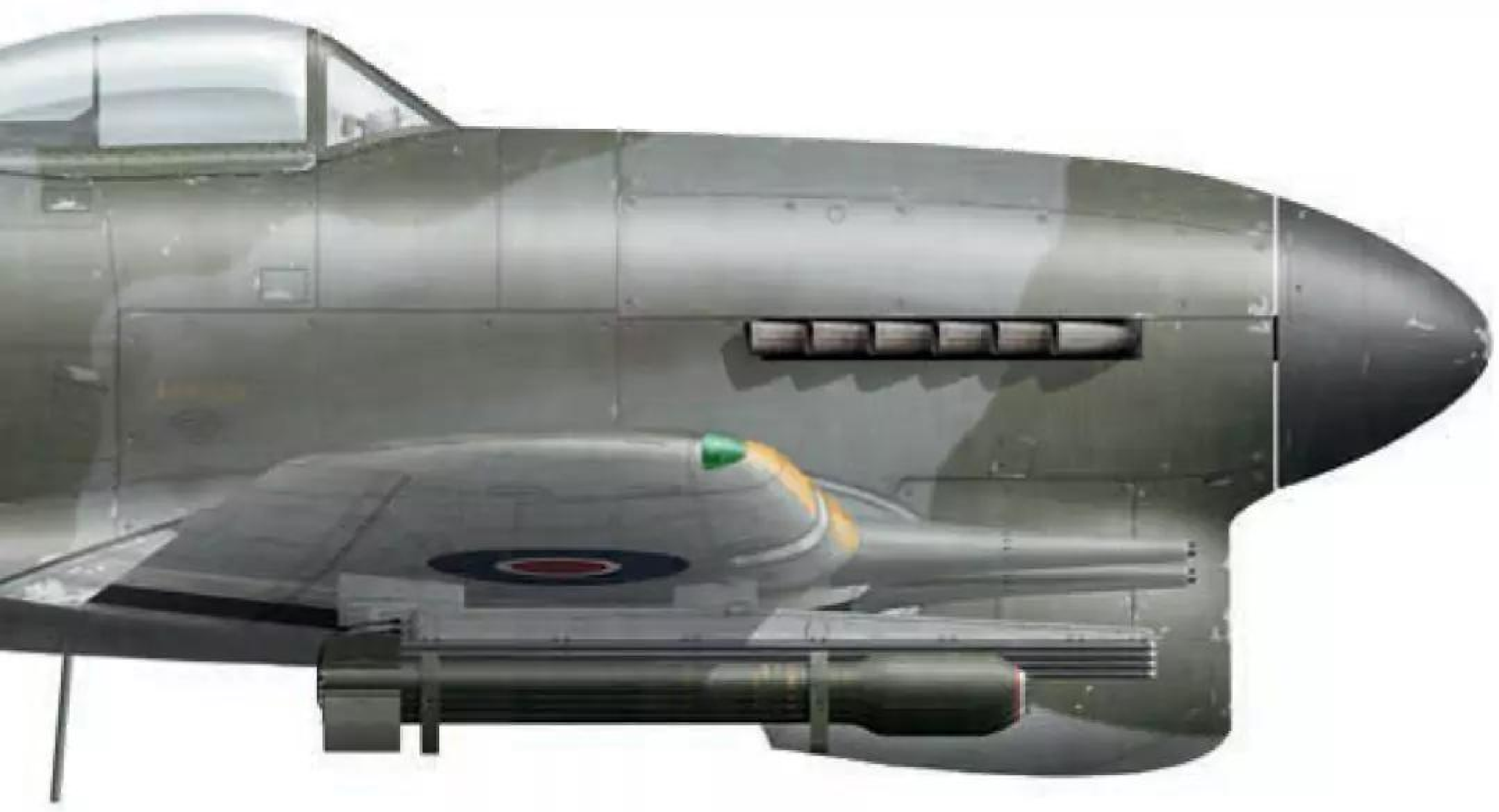
## HAWKER TYPHOON MK.IB ▲

Canadian pilot Flight Lieutenant Harry Hardy flew this Typhoon with 440 (RCAF) Squadron, stationed at Eindhoven, Holland, on April 2, 1944. Hardy flew Typhoons on 96 missions from August 10, 1944, to March 24, 1945, and was hit by enemy fire six times. He survived the war and was still alive at the time of writing aged 95.

## HAWKER TYPHOON MK.IB ▶

Squadron Leader Thomas Henry Vincent Pheloung, commanding officer of 56 Squadron, stationed at Matlaske, England, flew this Typhoon during January 1943. He was killed in action on June 20, 1943, after being hit by flak during a low-level attack on enemy shipping off the coast of the Netherlands. His men watched EK183 flip onto its back and crash into the sea.





to try and keep cockpit temperatures down and two vents were fitted below the port side radio hatch for the same purpose. The dorsal fairing was replaced with a transparent blister nicknamed the ‘coffin hood’ to improve visibility.

Finally, towards the end of 1942 and after numerous further tests, the Typhoon was able to demonstrate an acceptable level of reliability and continued to be used to counter Luftwaffe nuisance raids on the south coast of England. Meanwhile, bomb racks were designed which would allow the Typhoon to carry 500lb bombs.

A few months later, in early 1943, new Typhoons had plumbing installed in their wings which allowed them to use 45-gallon drop tanks – improving range dramatically from 690 miles to 1090 miles. Larger solid rubber tail-wheels were introduced in March 1943 to prevent shimmying and by mid-1943 every Typhoon was built with the attachment points needed to carry the new bomb racks. This also made small extensions to the cannon shell case ejector slots necessary so they would drop clear of any bombs or tanks fitted.

In addition, around 780lb of armour was added to protect the cockpit, engine and radiator bath from ground fire. Larger brake discs were eventually fitted too, to cope with the extra weight.

Experiments with fitting launch rails for 60lb RP-3 rockets were conducted in June 1943 and these were fitted to Typhoons operated by specialist fighter-bomber unit 181 Squadron from October 1943.

Beginning in November 1943, all new Typhoons rolling off the Gloster production line had a new one-piece sliding ‘bubble’ canopy fitted in place of the old ‘car door’ structure and a programme of recall and replacement was instituted for older machines.

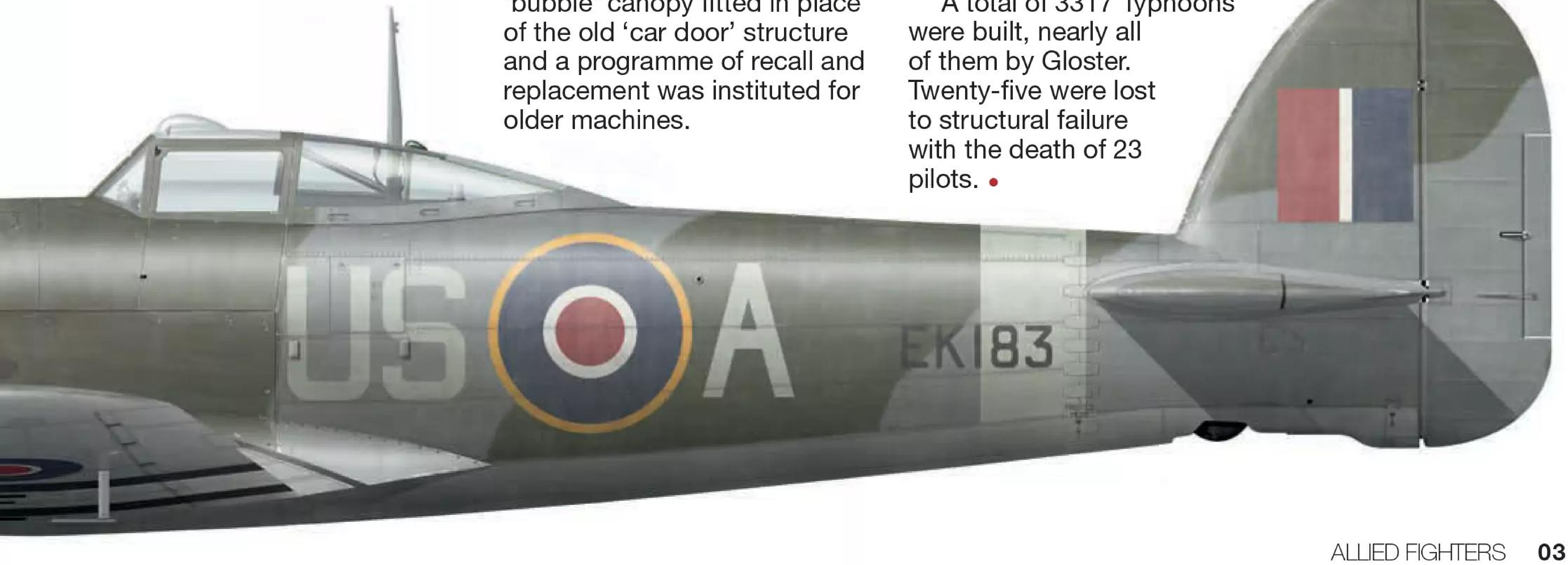
Early in 1944, it was decided that a four-bladed propeller should replace the original three-bladed type and that the larger tailplane of the Hawker Tempest should be fitted to improve stability – but both of these modifications took some time to introduce.

By the time of the D-Day landings and the subsequent Normandy campaign, the RAF had 18 operational Typhoon IB squadrons as part of the 2nd Tactical Air Force and a further nine as part of Air Defence of Great Britain. The dust and dirt whipped up by the powerful Sabre when the Typhoon was operating from hastily prepared forward landing grounds on the Continent necessitated the fitment of air filters and at the end of June 1944 it was decided that all Typhoons should have tropical filter kits installed as standard.

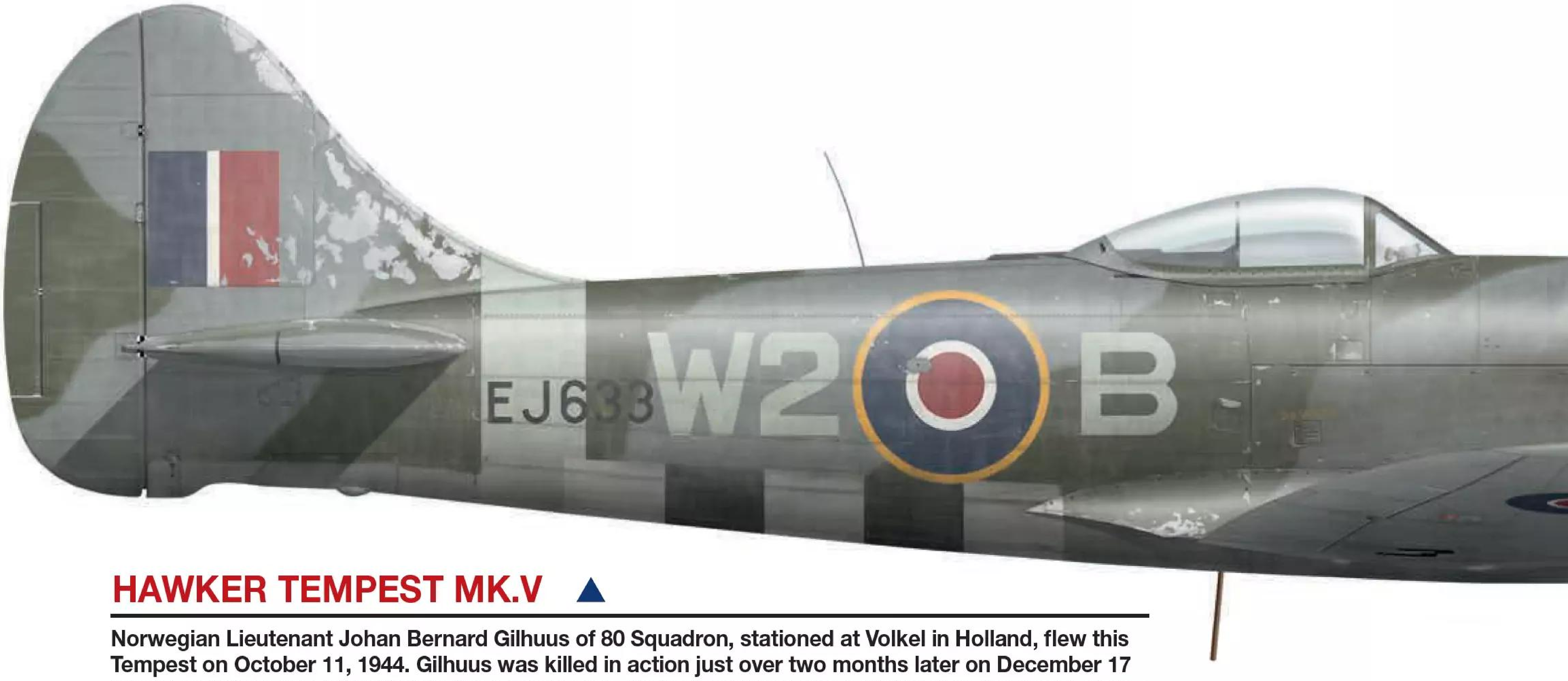
ROCKET LAUNCHER RAILS WERE FIRST FITTED TO THE TYPHOON IN JUNE 1943

While the Typhoon came increasingly to be regarded as a developmental dead end, several unusual versions were contemplated – R8694 was experimentally fitted with the more powerful Sabre IV by Napier, achieving a maximum speed of 452mph; R7881 became a prototype night fighter fitted with an AI (Airborne Interception) radar and a few examples of the Typhoon FR IB reconnaissance version were built. The latter had three F24 cameras fitted in place of its port inner cannon, one facing forward and two pointing straight down. Unfortunately, the Typhoon’s characteristic strong vibrations often meant that the resulting photographs were too blurry to be of any use.

A total of 3317 Typhoons were built, nearly all of them by Gloster. Twenty-five were lost to structural failure with the death of 23 pilots. •



# HAWKER TEMPEST

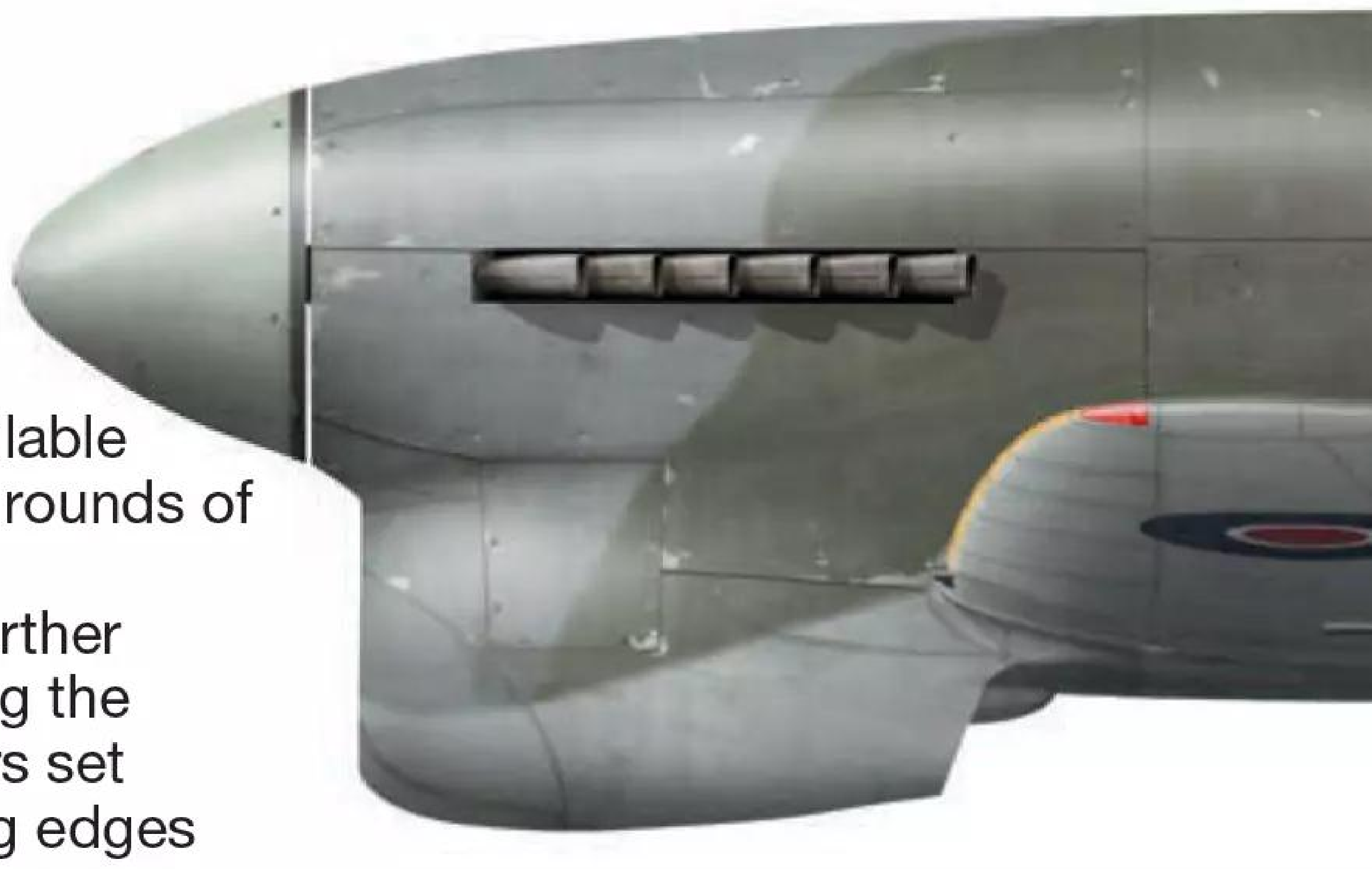


**HAWKER TEMPEST MK.V ▲**

**Norwegian Lieutenant Johan Bernard Gilhuus of 80 Squadron, stationed at Volkel in Holland, flew this Tempest on October 11, 1944. Gilhuus was killed in action just over two months later on December 17 when his fighter was hit by flak in the cockpit area. He had achieved one aerial victory the year before – a Fw 190 – and was the first and only Norwegian to die while flying a Tempest.**

**Conceived simply as the Typhoon Mark II, the Tempest earned itself a new name and went on to become one of the most powerful and deadly piston-engined fighters ever flown.**

1942-1953



Urgently needed on the front line yet beset by technical maladies and hampered by its too-thick wing, the Typhoon quickly became Hawker's problem child. Stung by the type's embarrassing flaws, the company's design team set about devising a new version that would be superior in every respect to the Mark I.

The first step was to improve the Typhoon's high-speed performance by fitting it with a thinner wing. This would improve airflow and therefore performance at higher altitudes and speeds. In addition, an elliptical shape was adopted which would allow the aircraft's four 20mm Hispano cannon to be set further back where the extra space available would allow for 200 rounds of ammunition apiece.

Drag would be further reduced by providing the aircraft with radiators set into the wing leading edges inboard of the landing gear for the type's chosen engine – the Napier Sabre IV. A four-bladed propeller would help to ease the seemingly incurable vibrations which afflicted the Typhoon Mark I and the pilot's visibility would be improved with a new sliding bubble canopy.

Tendering for Air Ministry Specification F.10/41 in November 1941, Hawker was awarded a contract for two prototype Typhoon Mark IIs. Since the Typhoon's sibling, the Tornado, had been cancelled a few months earlier due to the non-availability of its proposed Rolls-Royce Vulture engine, it was decided that Typhoon II prototypes should be fitted with a range of under-development engines.

The contract was expanded to six prototypes and given the ever-widening gulf between the design of the original Typhoon and the new aircraft it was given its own name on February 28, 1942 – the Tempest.

One Tempest was to be powered by the Sabre IV (Tempest I), as previously planned, two by the Bristol Centaurus (Tempest II), two by different Rolls-Royce Griffons (Tempest III and IV) and one by the Sabre II (Tempest V).

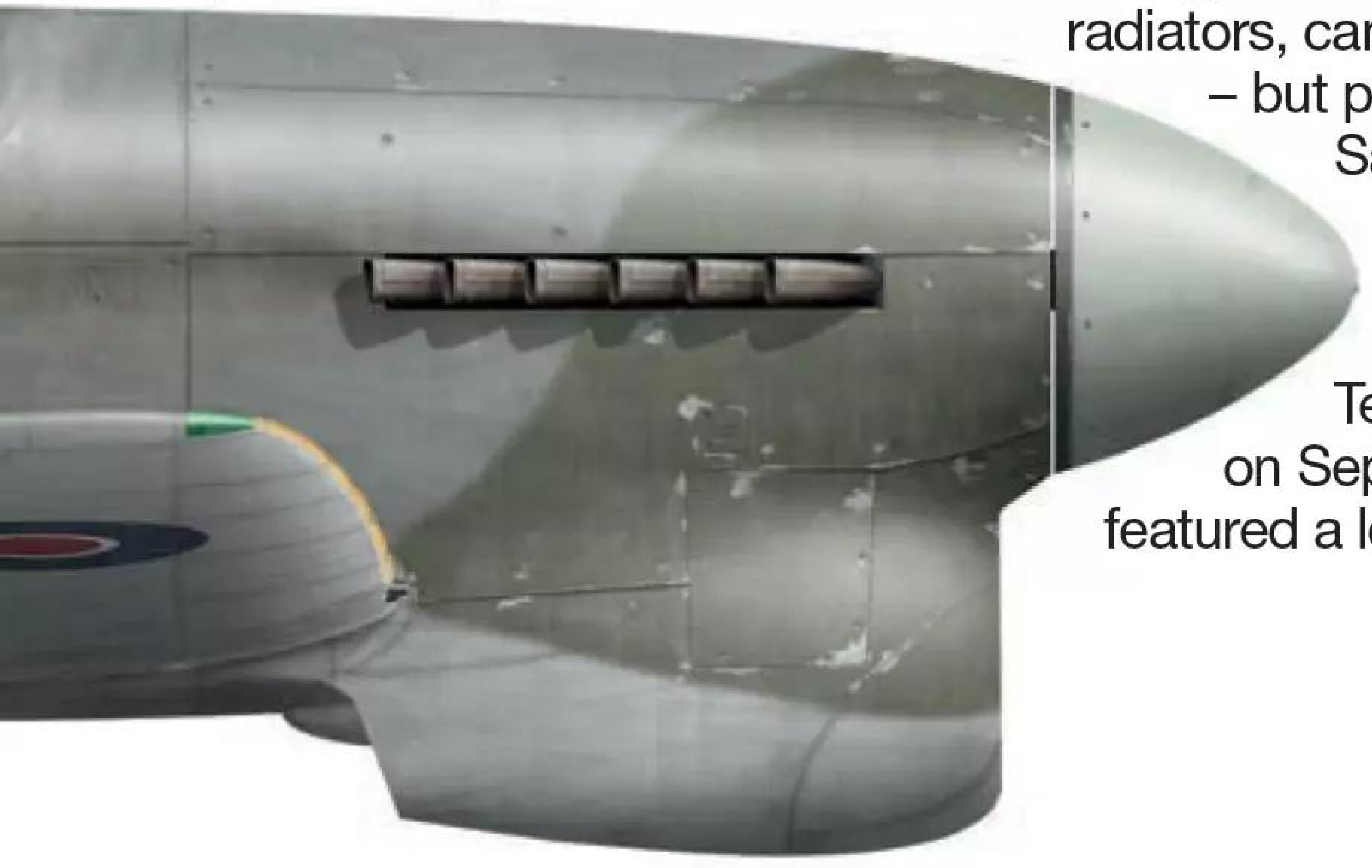
Good progress was made and in August 1942 the Air Ministry ordered 100 Tempest Vs and 300 Tempest Is, the latter to be built by Gloster in place of a planned batch of 300 Typhoons.

The Tempest I embodied the key design features planned for the Typhoon II – the new wings, radiators, canopy and propeller – but problems with the Sabre IV delayed its development. The first prototype to fly was the Tempest V, HM595, on September 2. This featured a longer fuselage than that of the Typhoon, 33ft 8in compared to the 31ft 11½in of the latter, plus the new wings but without the new radiators or cockpit canopy. The tail unit was also very similar to that of the Typhoon.

The undercarriage main legs were longer than those of the Typhoon with a wider track to improve stability during landing and to provide better clearance for the propeller. Fitted with trunnions, the legs were shortened as they retracted to fit within their housings. The tailwheels was also retractable and fully enclosed.

In November it was fitted with the new cockpit design, which had a centre panel comprising a 1½in thick outer layer and a ¼in thick inner layer to make it bullet-resistant. The frame was

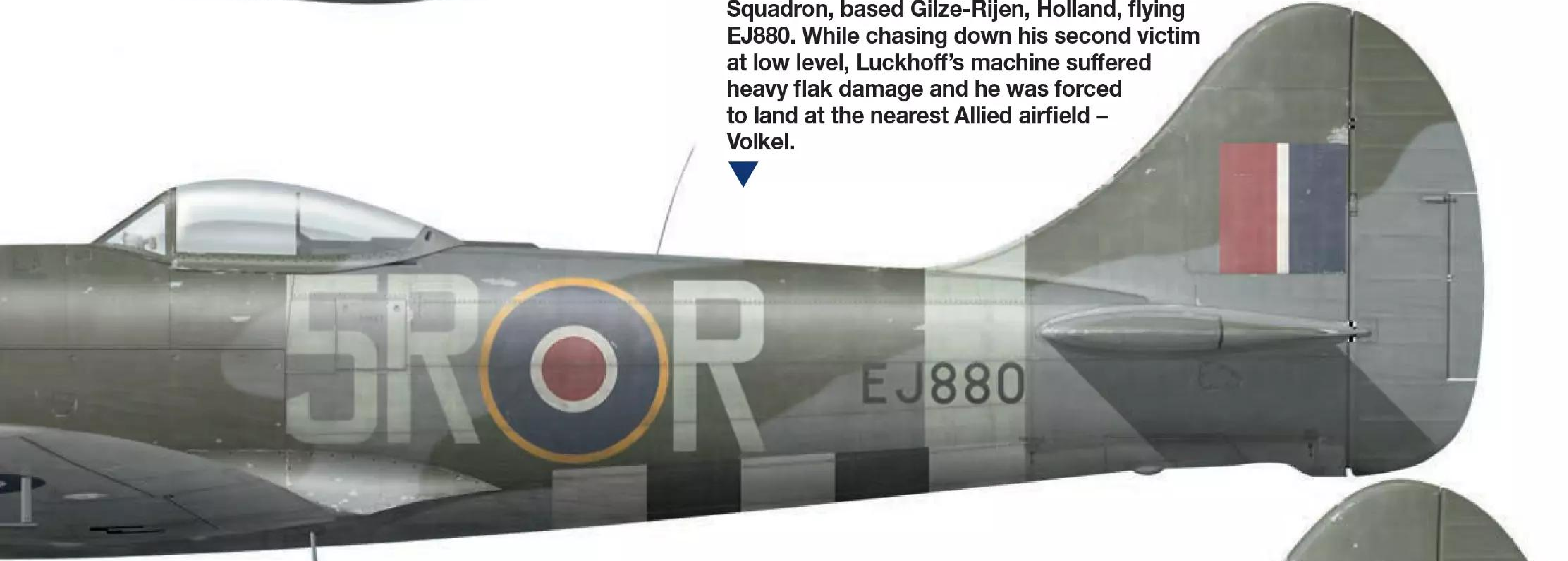
SIX DIFFERENT TEMPEST PROTOTYPES WERE PLANNED WITH SIX DIFFERENT ENGINES

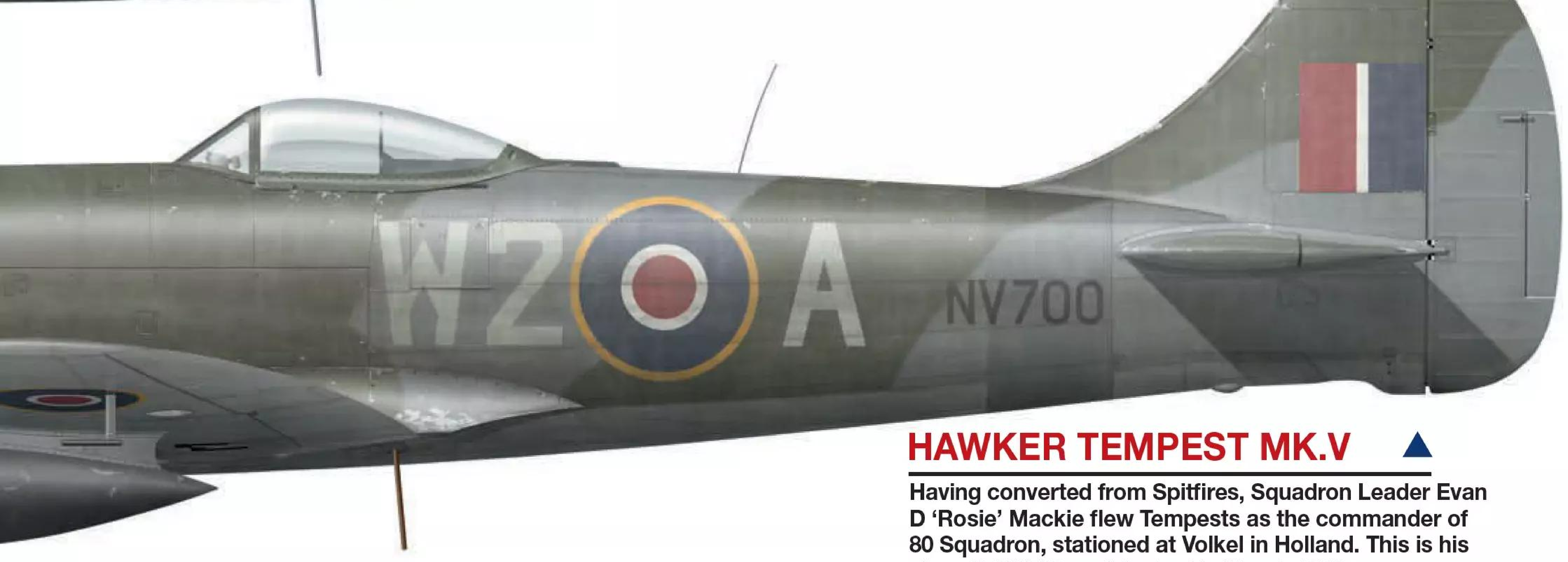


### HAWKER TEMPEST MK.V

**Two Bf 109s were shot down on February 25, 1945, by Flight Lieutenant L C Luckhoff of 33 Squadron, based Gilze-Rijen, Holland, flying EJ880. While chasing down his second victim at low level, Luckhoff's machine suffered heavy flak damage and he was forced to land at the nearest Allied airfield – Volkel.**

▼

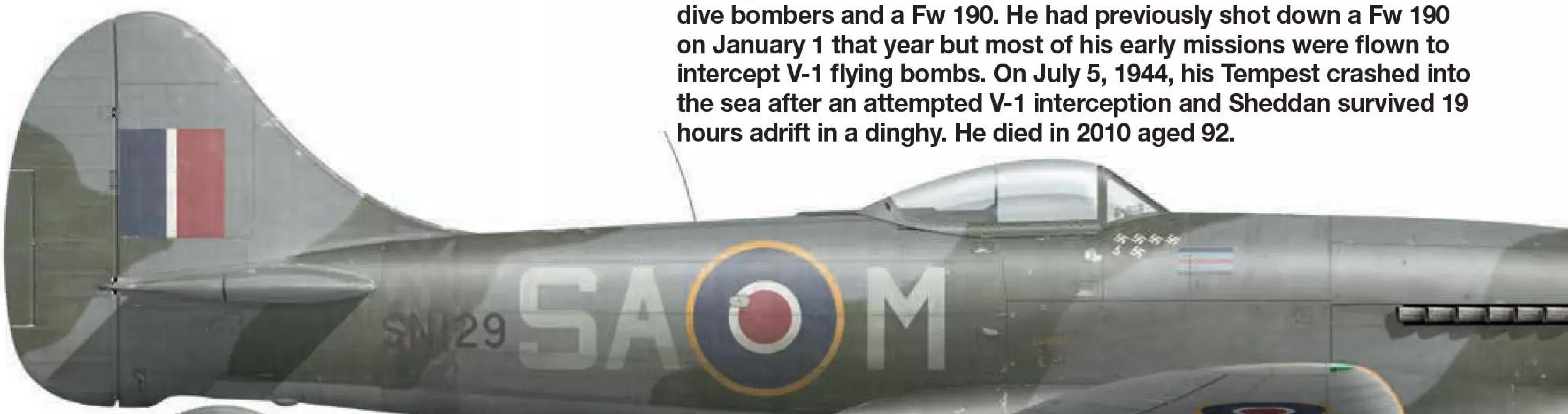




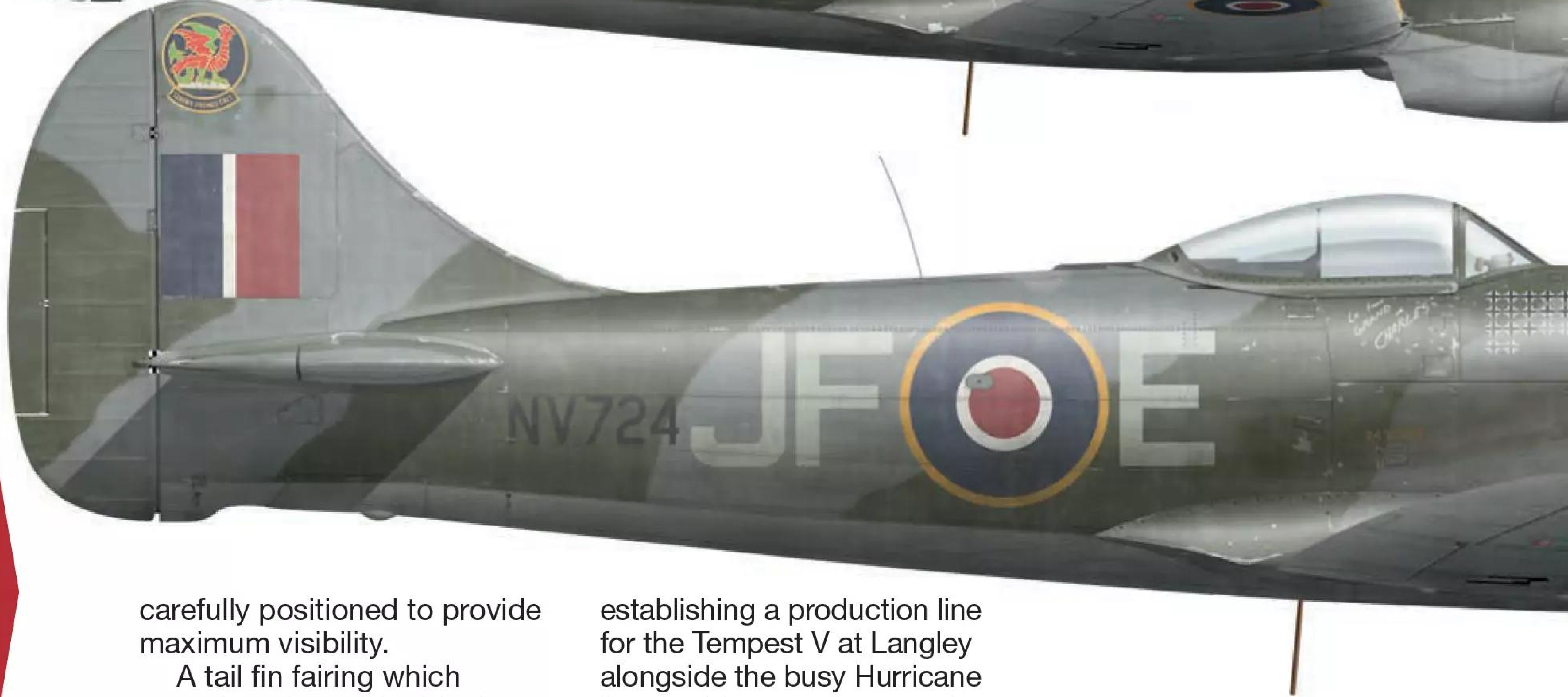
### HAWKER TEMPEST MK.V ▲

**Having converted from Spitfires, Squadron Leader Evan D 'Rosie' Mackie flew Tempests as the commander of 80 Squadron, stationed at Volkel in Holland. This is his aircraft, NV700, as it looked in March 1945.**

## HAWKER TEMPEST MK.V



**During April 1945, New Zealander Flight Lieutenant James C 'Jimmy' Sheddan of 486 Squadron shot down two Junkers Ju 87 dive bombers and a Fw 190. He had previously shot down a Fw 190 on January 1 that year but most of his early missions were flown to intercept V-1 flying bombs. On July 5, 1944, his Tempest crashed into the sea after an attempted V-1 interception and Sheddan survived 19 hours adrift in a dinghy. He died in 2010 aged 92.**



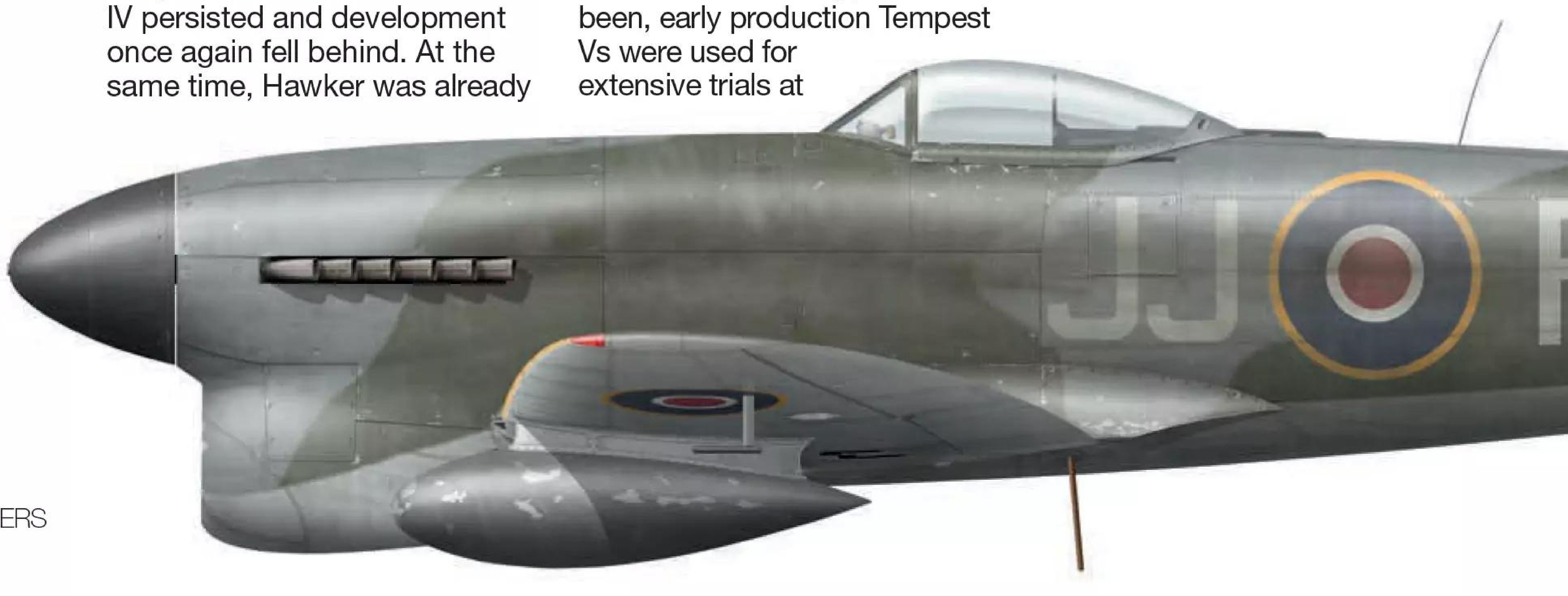
carefully positioned to provide maximum visibility.

A tail fin fairing which served to almost double the fin's vertical surface area was also added and the tailplanes were modified to increase both their span and chord. Pilots found that the combination of modifications succeeded in eliminating most of the Typhoon's vices – making the Tempest an altogether more pleasant aircraft to fly.

Finally, on February 24, 1943, the Tempest Mark I prototype HM599 flew for the first time. Its clean lines and powerful engine enabled it to reach a top speed of 466mph but problems with the Sabre IV persisted and development once again fell behind. At the same time, Hawker was already establishing a production line for the Tempest V at Langley alongside the busy Hurricane line. Problems encountered with constructing the rear spar caused delays but the first production machine flew on June 21, 1943.

The Tempest III prototype, LA610, did not make its first flight until November 27, 1944, and it was ultimately cancelled because the Spitfire took priority when it came to the supply of Griffon engines. The Tempest IV was cancelled without being flown and the Tempest II will be discussed in greater detail below.

Rather than being rushed into service as the Typhoon had been, early production Tempest Vs were used for extensive trials at



Boscombe Down. The type was not cleared for front line service until April 8, 1944. The first 100 examples had Hispano Mk.II cannon characterised by their long barrels which protruded from the leading edge of the aircraft's wings. Later Tempests had Hispano Vs, with short barrels which sat flush with the wing leading edges.

As the number of Tempests being delivered to squadrons increased, further features were added and others altered. New aircraft came fitted with a Rebecca transponder from mid-to-late 1944, which required the addition of an aerial under the port side centre section.

On active service, the Tempest performed best when operating at low to medium altitude and was found to be well-suited to long-range armed reconnaissance operations thanks to its ability to carry a pair of 45-gallon drop tanks and the excellent field of vision afforded by its bubble canopy.

When German forces began launching V-1 flying bombs at London during June 1944, the Tempest demonstrated its ability to both catch and destroy the 'robot' invaders. It was also able to remain in the air for extended periods on patrol while waiting for V-1s to appear.

Beginning on September 21, 1944, Tempests were operated from forward airfields on the Continent by the 2nd Tactical Air Force. Between late October and mid-December, most were withdrawn for maintenance and on their return they were flown as an air superiority fighter, seeking out and destroying Luftwaffe combat aircraft at low level – sometimes with medium to high altitude cover from Spitfire XIVs.

During the final months of the war, the Tempest achieved an estimated 6:1 success rate against enemy single-seat fighters, even shooting down a number of Messerschmitt Me 262 jet fighters.

## HAWKER TEMPEST MK.V

**Flight Lieutenant Pierre H Clostermann, a Frenchman, served with 3 Squadron as the war drew to a close. After the war ended he flew this aircraft, NV724, while stationed at Lübeck in Germany in July 1945. He had joined the Free French Air Force in Britain in March 1942 and scored his first two victories, both Fw 190s, on July 27, 1943, while flying a Spitfire. He ended the war having flown 432 combat sorties and achieved 19 victories plus 14 shared, 72 Locomotives, 225 motor vehicles, five tanks and two torpedo boats. He died in March 2006 aged 85.**

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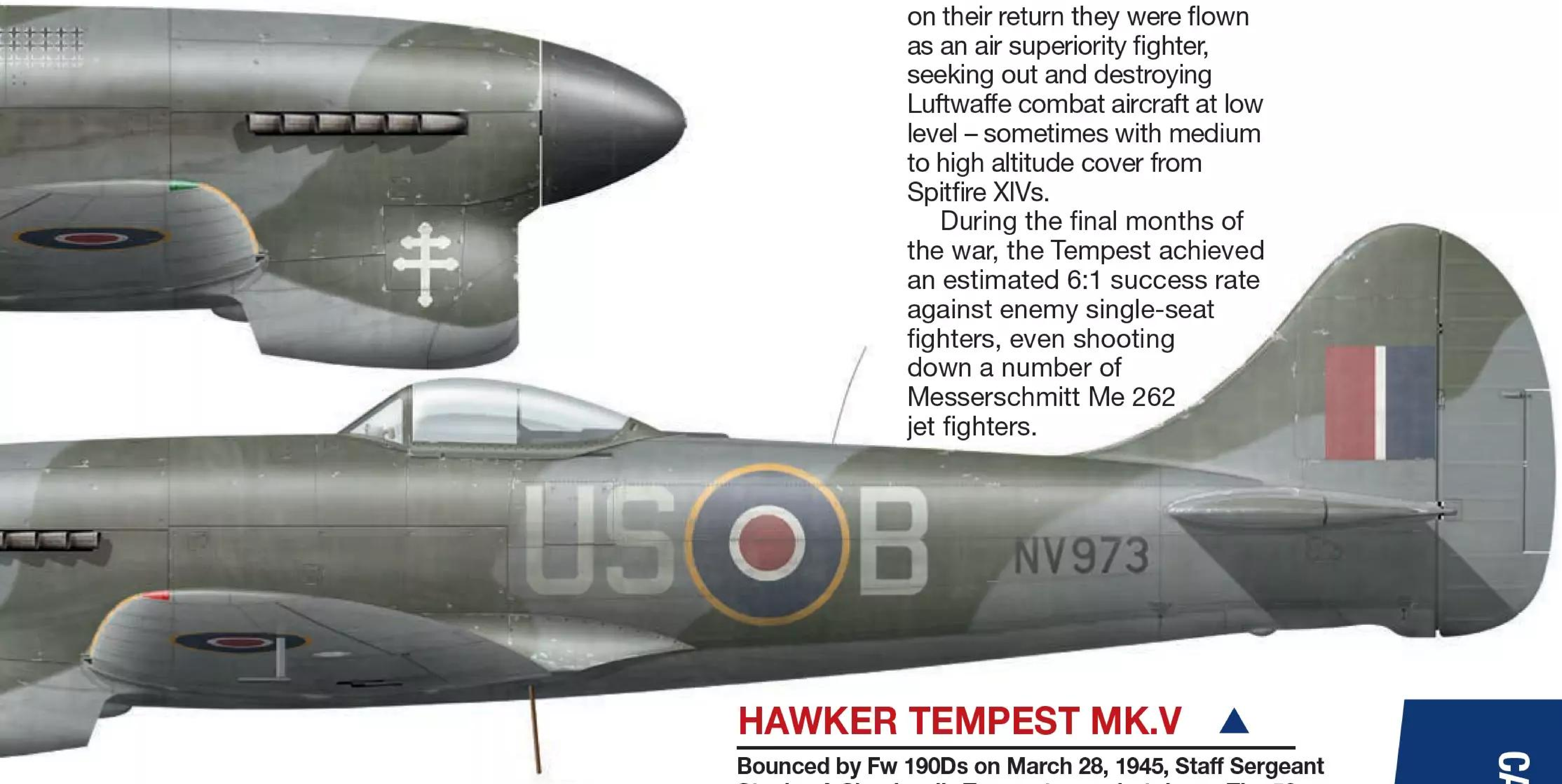
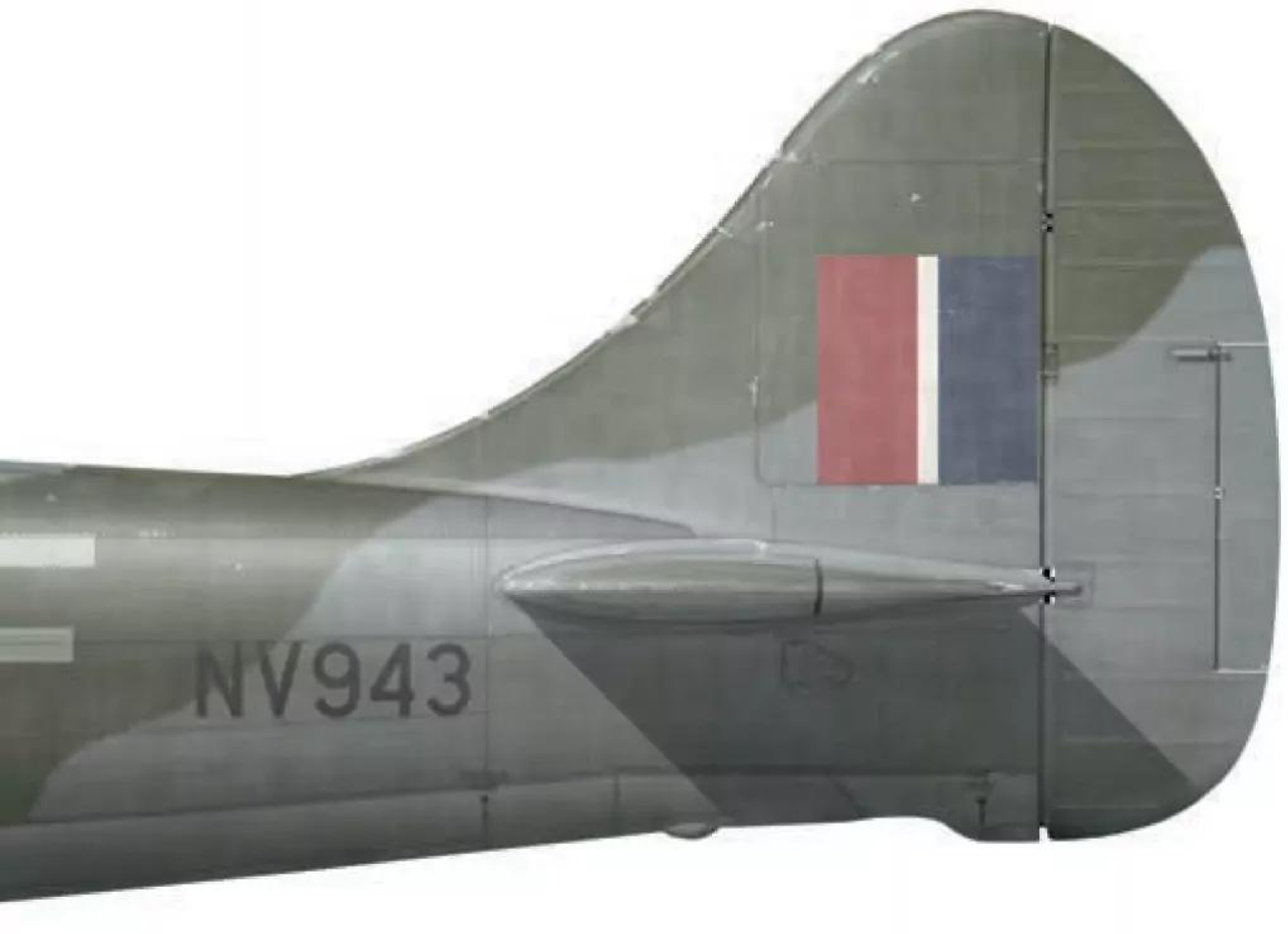


## HAWKER TEMPEST MK.V ▲

**Bounced by Fw 190Ds on March 28, 1945, Staff Sergeant Stanley A Shepherd's Tempest was shot down. The 56 Squadron pilot crashed near Schoonrewoerd in the Netherlands but survived. He was approached by two locals who wanted to get him under cover and hide him but Shepherd decided that he first needed to return to his wrecked aircraft to retrieve his gun. This delay meant he was captured by German soldiers who had rushed to the crash site, and he was later shot.**

TEMPESTS WERE USED TO CATCH AND SHOOT DOWN V-1 FLYING BOMBS



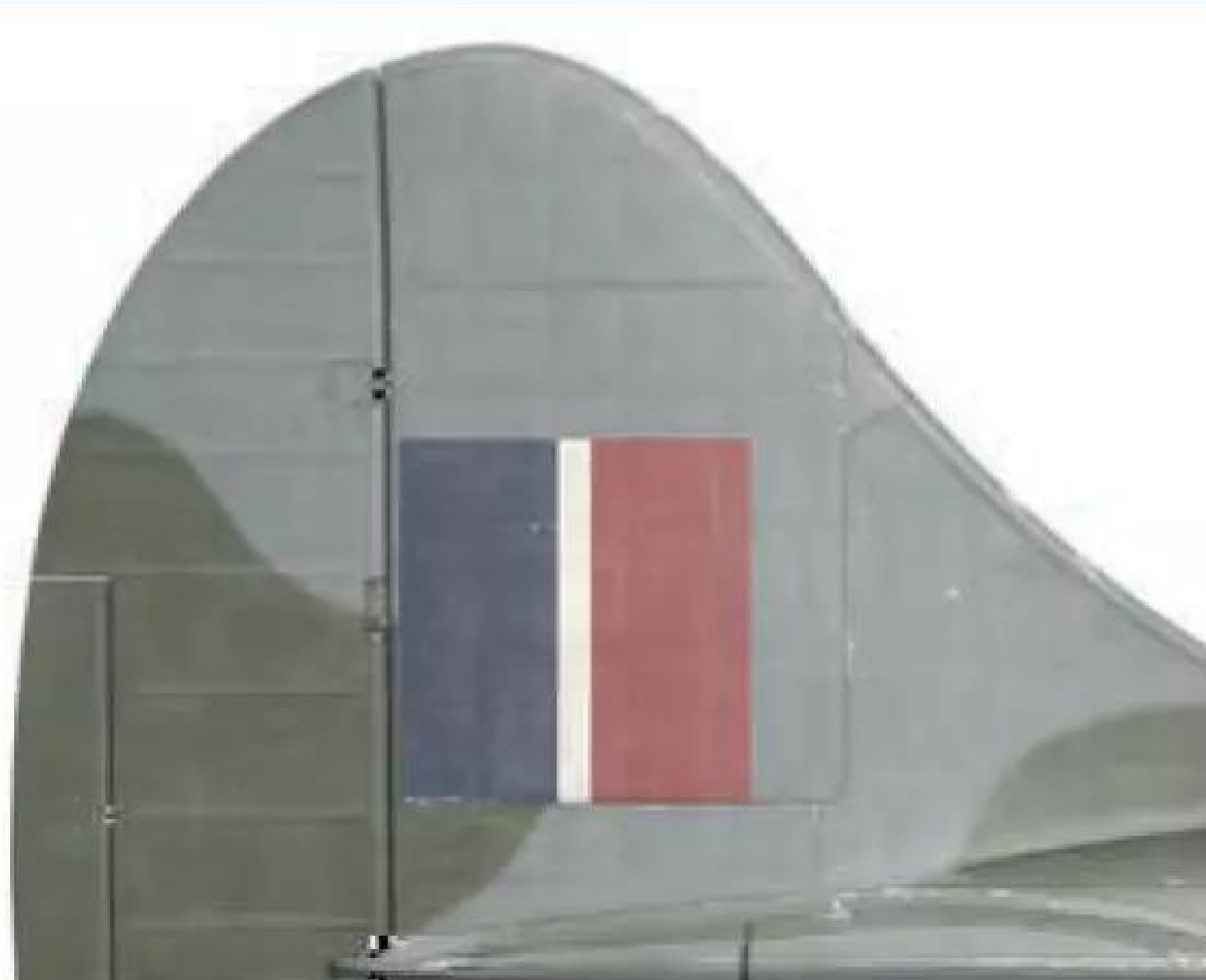
## HAWKER TEMPEST MK.V

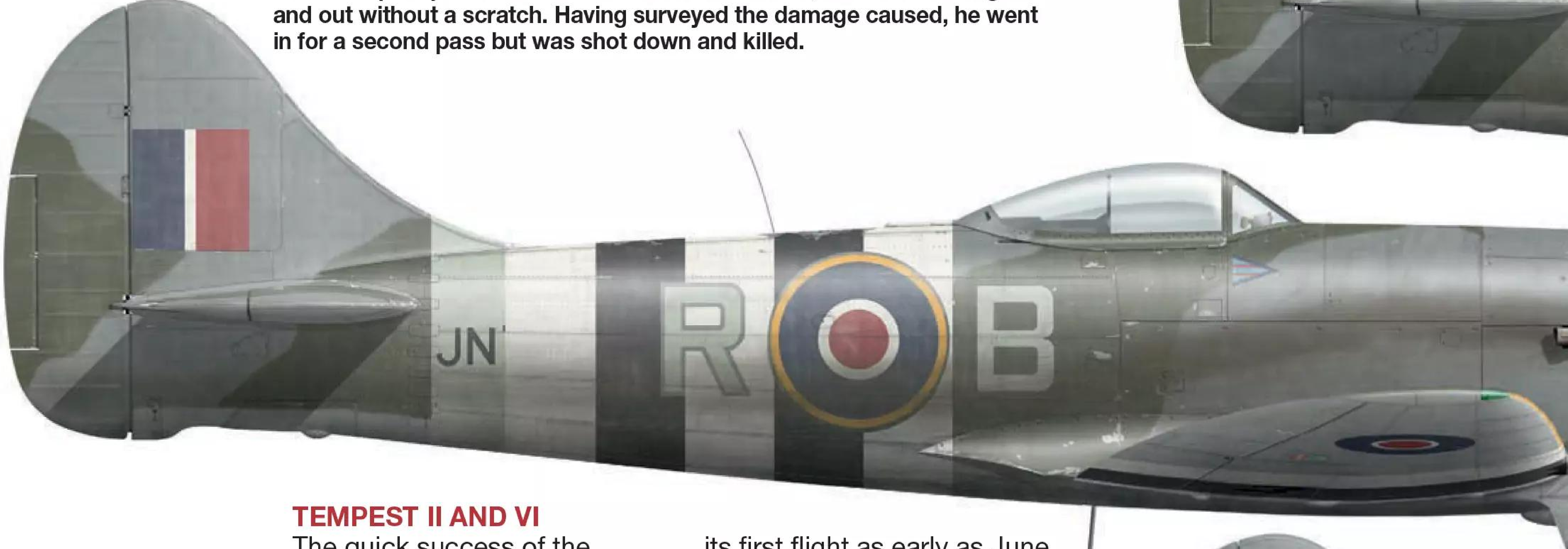
**Nicknamed the 'Terror of the Rhine', Squadron Leader David 'Foob' Fairbanks, an American who joined the RAF via Canada, was the highest scoring Tempest ace with 11 victories. Serving with 274 Squadron on February 24, 1945, he scored his final 'kill': a Fw 190 over Plantlunne, Germany. Four days later, he led six Tempests into an attack on a formation of 40 Fw 190s and Bf 109s, eventually being shot down by one of the Fw 190s. He spent the rest of the war as a PoW.**

◀

## HAWKER TEMPEST MK.V

**Having been a 'millionaire playboy' on the Greek island of Chios, Basilios Michael 'Vass' Vassiliades joined the RAF in 1942. By March 1945 he was serving with 3 Squadron based at Volkel in the Netherlands. He scored his 10th and last victory flying this aircraft on March 7, shooting down Fw 190D-9 'Yellow 15'. On March 25, he attacked a convoy of trucks well behind enemy lines which was protected by a concentration of flak batteries. His wingman was shot down almost immediately and the two other Tempest pilots refused to continue the attack, but Vassiliades got in and out without a scratch. Having surveyed the damage caused, he went in for a second pass but was shot down and killed.**





### TEMPEST II AND VI

The quick success of the Tempest V led to an unusual situation where the Mark V was in service long before any of the earlier marks. However, the Mark II did eventually reach full series production – the only other version to do so.

Powered by a Bristol Centaurus IV engine, the Tempest II looked significantly different from both the original Typhoon and its sibling the Tempest V. The 18-cylinder Centaurus was radial in shape, rather than inline like the 24-cylinder Sabre, and air- rather than liquid-cooled. It therefore featured a tight cylindrical cowl with its exhausts stacked on either side. Its air intakes were positioned on the leading edges of both wings and another air intake along with the oil cooler were installed on the inner starboard wing.

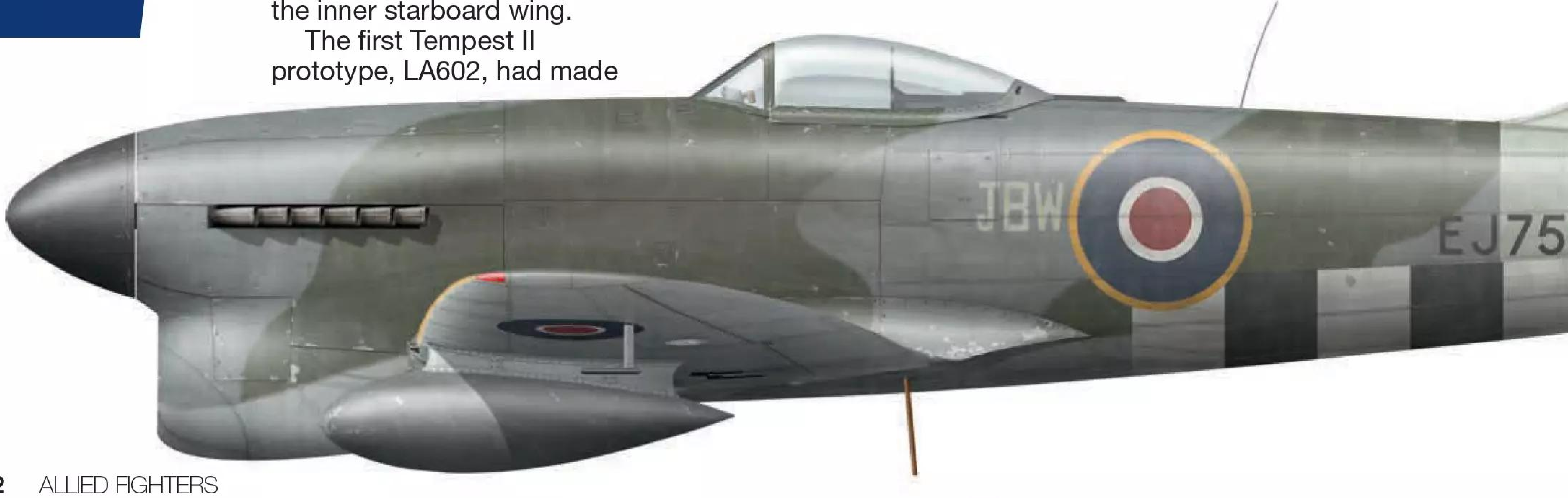
The first Tempest II prototype, LA602, had made its first flight as early as June 28, 1943, and the second flew for the first time on September 18, 1943. Severe engine vibration was experienced early on but was largely cured with the replacement of the usual rigid eight-point engine mountings with six-point rubber insulated shock mounts. In addition, the four-bladed propeller was briefly replaced with a five-bladed unit until a rebalanced version of the original was adopted.

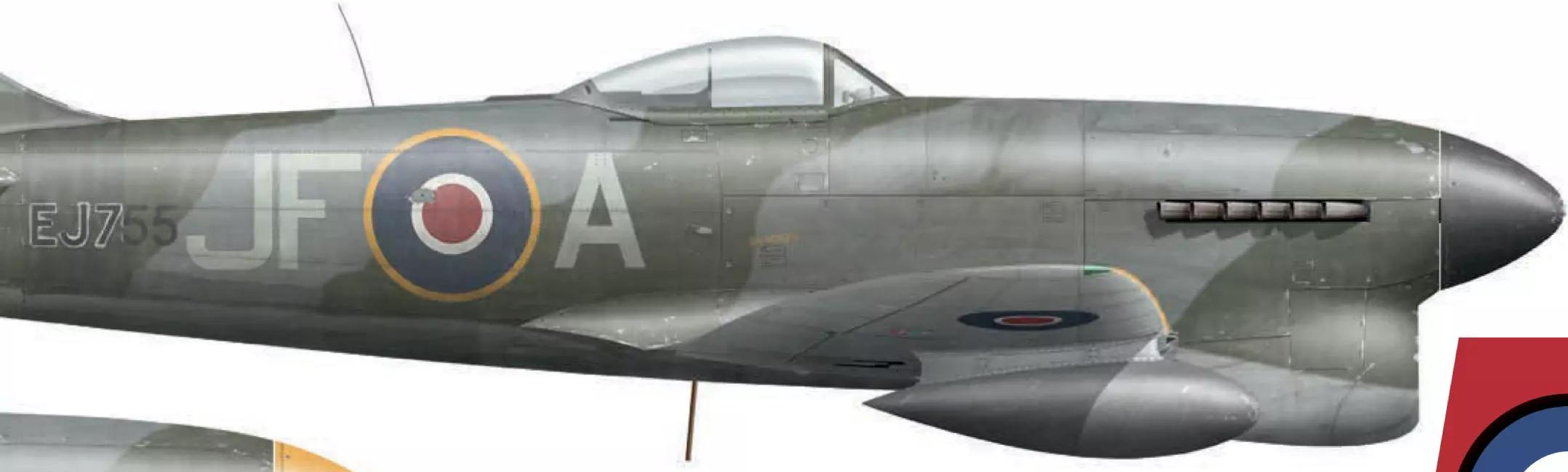
Longer than the Tempest V at 34ft 5in, the Tempest II was only slightly heavier even though the Centaurus weighed 2695lb compared to the Sabre's 2360lb.

**THE TEMPEST MK.V ENTERED SERVICE BEFORE ANY OF THE EARLIER MARKS**

## HAWKER TEMPEST MK.V

**A handful of Messerschmitt Me 262 jet fighters were shot down by Tempests and among them were two destroyed by Wing Commander John Basil Wray, of 122 Wing, flying this machine.**



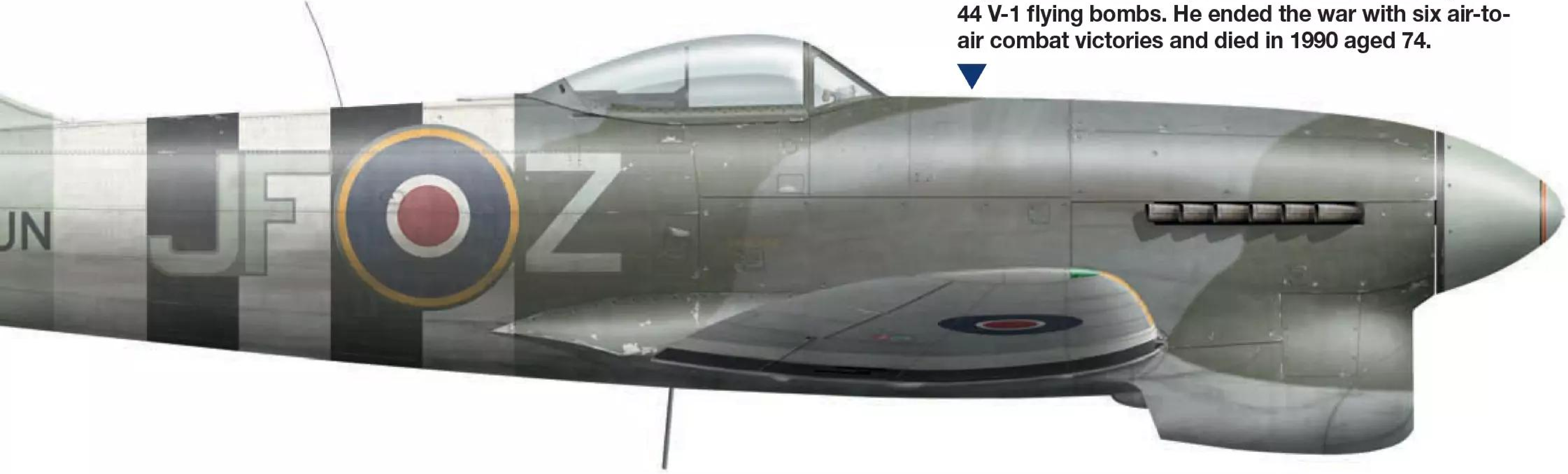


## HAWKER TEMPEST MK.V

**Wing Commander Roland P Beaumont commanded the first Tempest wing, 150 Wing, stationed at Newchurch, England, during June 1944. This was his aircraft at the time. Four months later, he was shot down while flying a Tempest near Nijmegen and became a prisoner of war until he was released by Soviet forces in May 1945.**

## HAWKER TEMPEST MK.V

**Flying this Tempest with 3 Squadron, Belgian ace Flight Lieutenant Remy Van Lierde shot down up to 44 V-1 flying bombs. He ended the war with six air-to-air combat victories and died in 1990 aged 74.**



This was because the former did not require the heavy radiator unit of the latter – the overall difference amounting to just 20lb in the Tempest V's favour. The Tempest II was also 10mph faster at a top speed of 442mph.

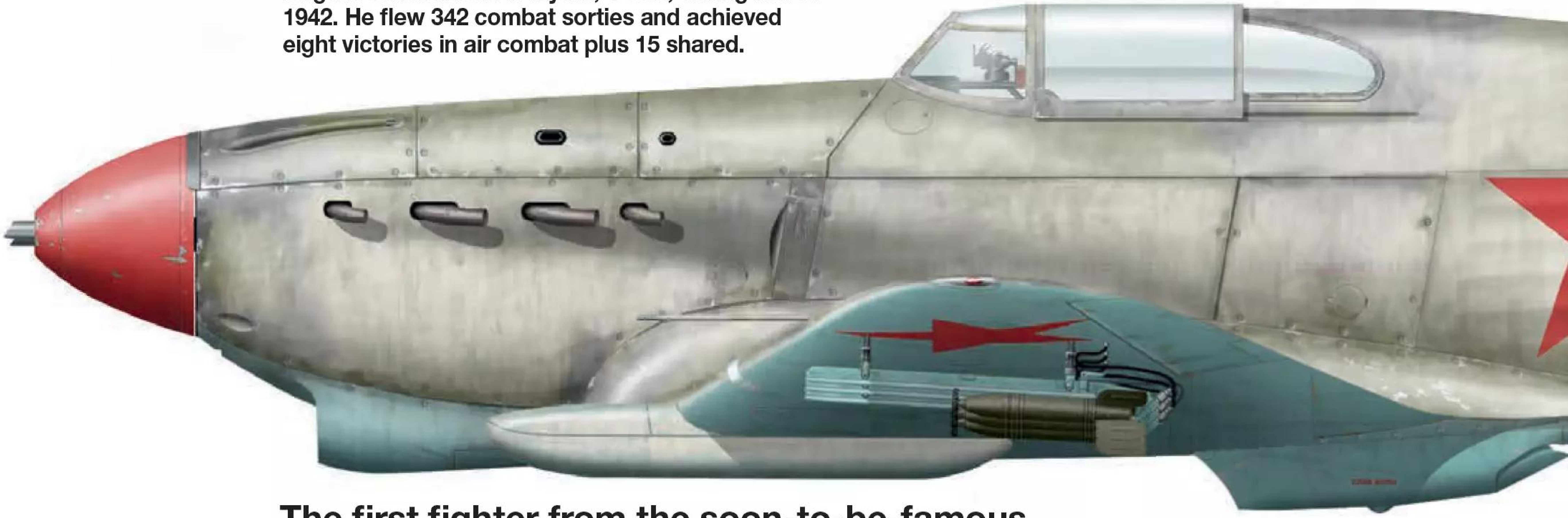
The first production Tempest II, powered by the Centaurus V, was rolled out on October 4, 1944, but the first six off the line were removed for further trials rather than being allocated to front line units. The type was earmarked for the fight against Japan in the Far East but the war ended before it could enter service.

The last Tempest was the Mark VI, powered by the Sabre V. The original Tempest V prototype, HM595, was heavily modified to become the Tempest VI prototype, first flying in its new configuration on May 9, 1944. Two more Tempest Vs, EJ841 and JN750, were also converted to Tempest VI standard in 1945 and the type enjoyed a brief production run of 142 aircraft – eventually making it the last piston-engined fighter in operational service with the RAF. A total of 1702 Tempests of all types were produced. ●

# YAKOVLEV

### YAKOVLEV YAK-1 ▼

**This rocket-armed tail-ski Yak-1 was flown by Kapitan Boris Nikolayevich Yeryomin, commander of the 2nd Eskadrilya, 296 IAP, stationed at Brigadirovka Airfield in Izyum, USSR, during March 1942. He flew 342 combat sorties and achieved eight victories in air combat plus 15 shared.**



**The first fighter from the soon-to-be-famous Yakovlev aviation bureau, the Yak-1 was a landmark design that would pave the way for some of the Soviet Air Force's best Second World War aircraft.**

At the end of the 1930s the Soviet government realised that the fighter aircraft equipping its air force were becoming increasingly outdated compared to the latest types being produced in Western Europe and instigated a programme of development that would redress the balance.

The Soviet Union's best and brightest young designers were handed this task and given enormous resources with which to see it through. Among them was Aleksandr Sergeyevich Yakovlev, aged 33 in 1939. He had designed his first powered aircraft in 1927 and graduated from the Zhukovsky Air Force Military Engineering Academy in 1931.

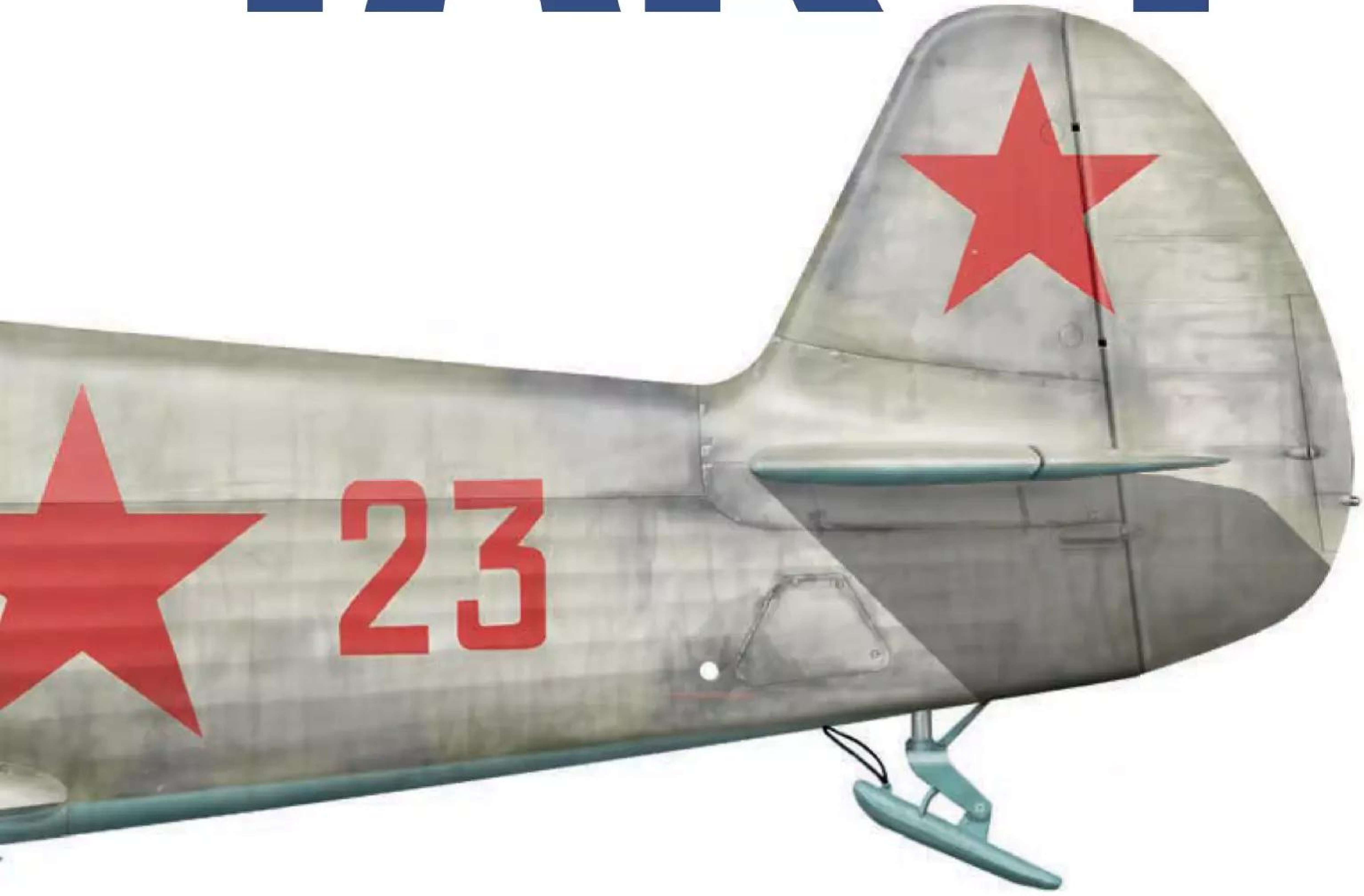
He was then assigned to Moscow Aviation Plant No. 39 and established his first design office there, working on lightweight aircraft, the following year. He became the head of the Yakovlev Design Bureau in 1935.

When a competition was held in 1939 to produce the next standard Soviet single-seat fighter, he submitted four designs based on essentially the same airframe – a basic fighter (designated I-26), trainer (I-27), high-altitude fighter (I-28) and heavy fighter (I-30). Work on these concepts had begun in May and the basic fighter design, a sleek low-wing monoplane with fully enclosed cockpit and retractable undercarriage, was approved for first mock-up and then prototype production in October.

The I-26-1 prototype was rolled out in January 1940, making its first flight on the 13th equipped with a ski undercarriage due to the icy ground conditions at that time of year. The fuselage structure was made of welded steel tubing and the forward fuselage had skin made from duralumin. The rear fuselage, however, had a fabric skin supported by wooden planks. The wings were wooden too. Although it had been hoped that a supercharged version of the Klimov M-105 engine could power it, this was unavailable

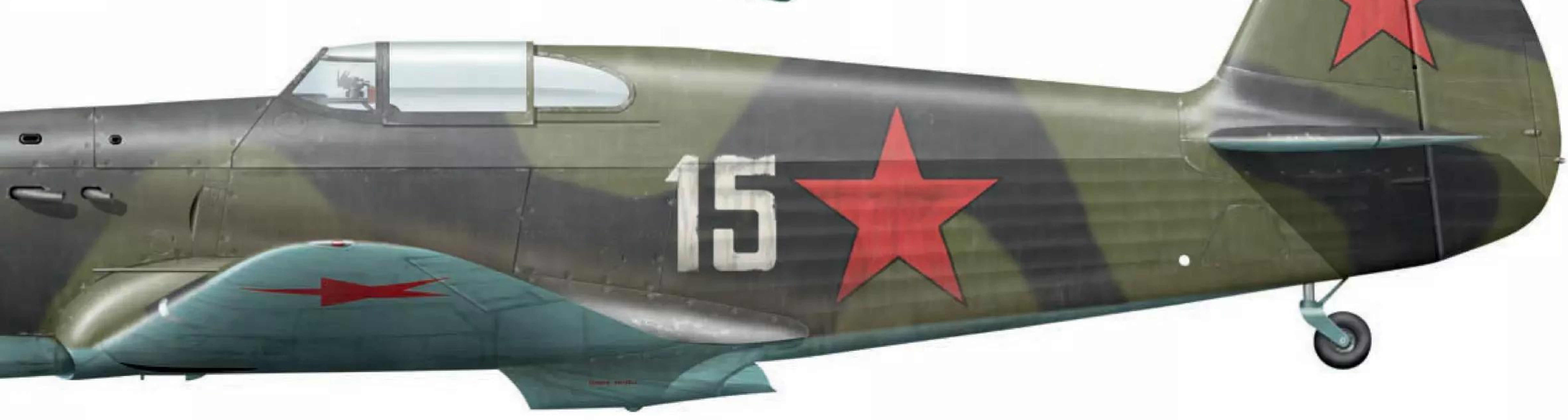
# YAK-1

THE YAK-1 HAD JUST ENTERED SERVICE WHEN WW2 BEGAN



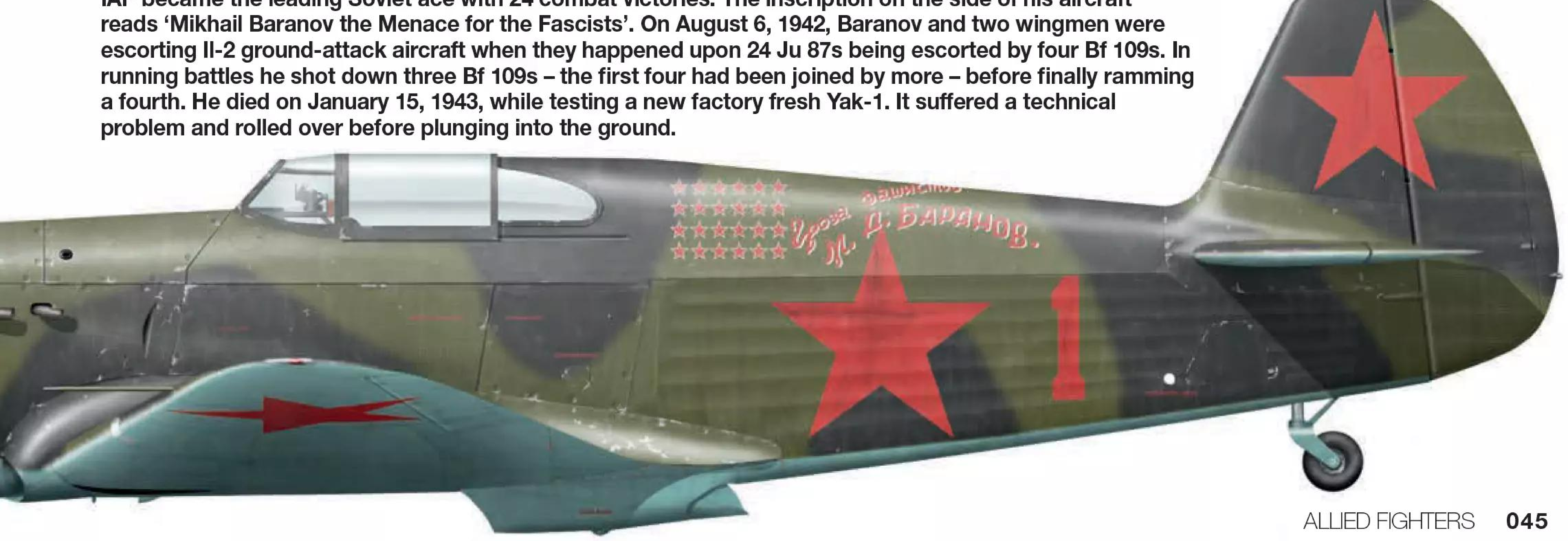
## YAKOVLEV YAK-1B ▼

Starshiy Leytenant Pavel Pavlov, an ace who achieved 12 victories in air combat plus five shared, flew this aircraft while serving with 21st IAP, stationed in the Leningrad area, USSR, during the summer of 1942.



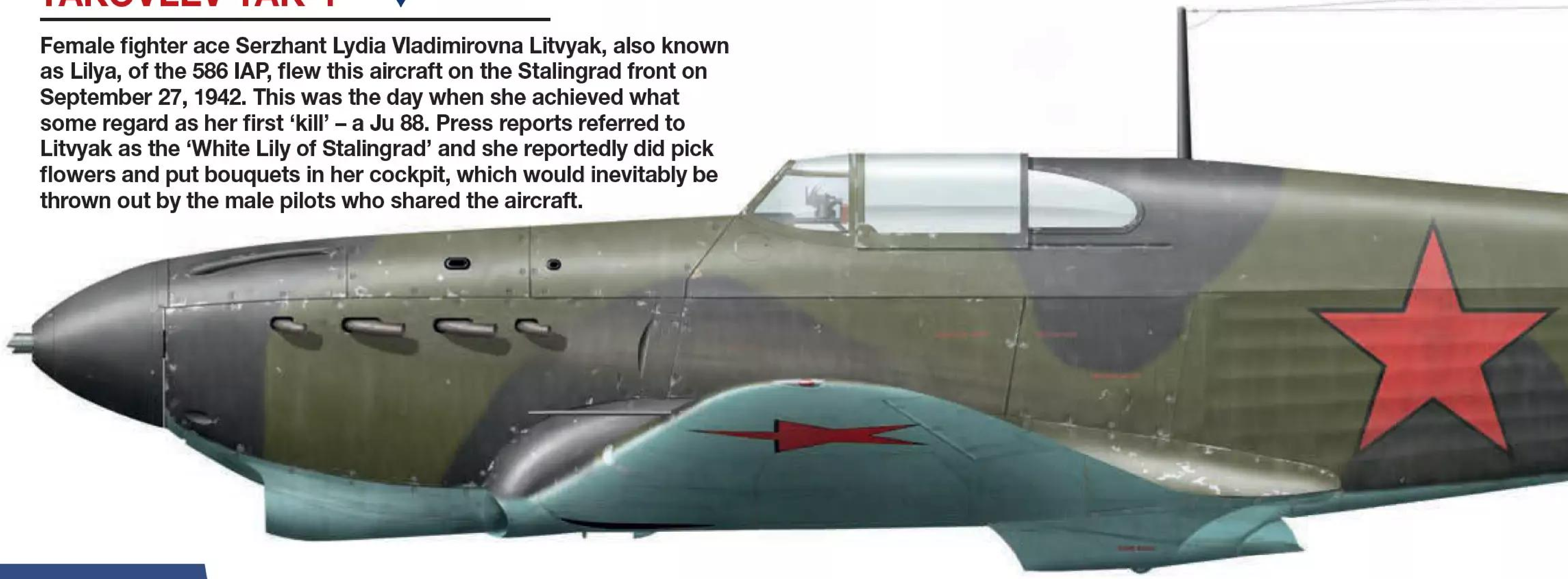
## YAKOVLEV YAK-1 ▼

During the early stages of the Battle of Stalingrad, Starshiy Leytenant Mikhail Dmitrievich Baranov of 183 IAP became the leading Soviet ace with 24 combat victories. The inscription on the side of his aircraft reads 'Mikhail Baranov the Menace for the Fascists'. On August 6, 1942, Baranov and two wingmen were escorting Il-2 ground-attack aircraft when they happened upon 24 Ju 87s being escorted by four Bf 109s. In running battles he shot down three Bf 109s – the first four had been joined by more – before finally ramming a fourth. He died on January 15, 1943, while testing a new factory fresh Yak-1. It suffered a technical problem and rolled over before plunging into the ground.



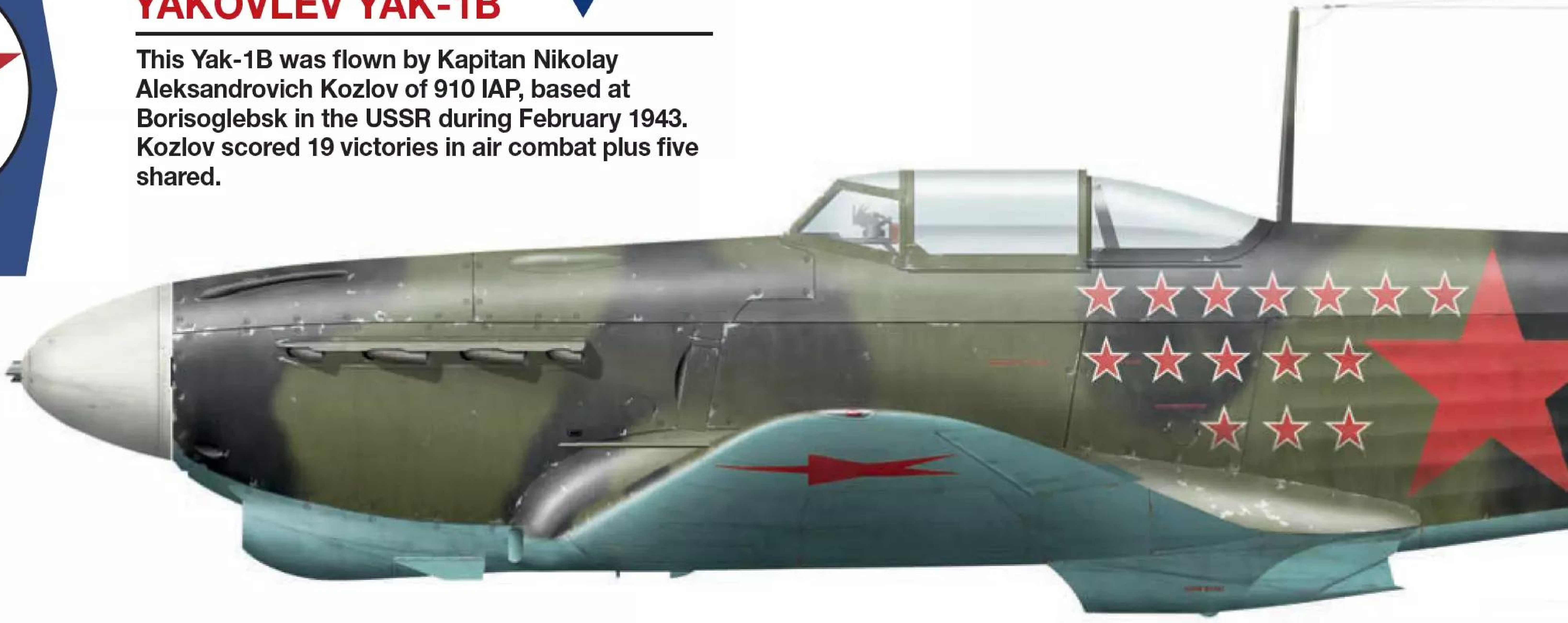
## YAKOVLEV YAK-1

**Female fighter ace Serzhant Lydia Vladimirovna Litvyak, also known as Lilya, of the 586 IAP, flew this aircraft on the Stalingrad front on September 27, 1942. This was the day when she achieved what some regard as her first 'kill' – a Ju 88. Press reports referred to Litvyak as the 'White Lily of Stalingrad' and she reportedly did pick flowers and put bouquets in her cockpit, which would inevitably be thrown out by the male pilots who shared the aircraft.**



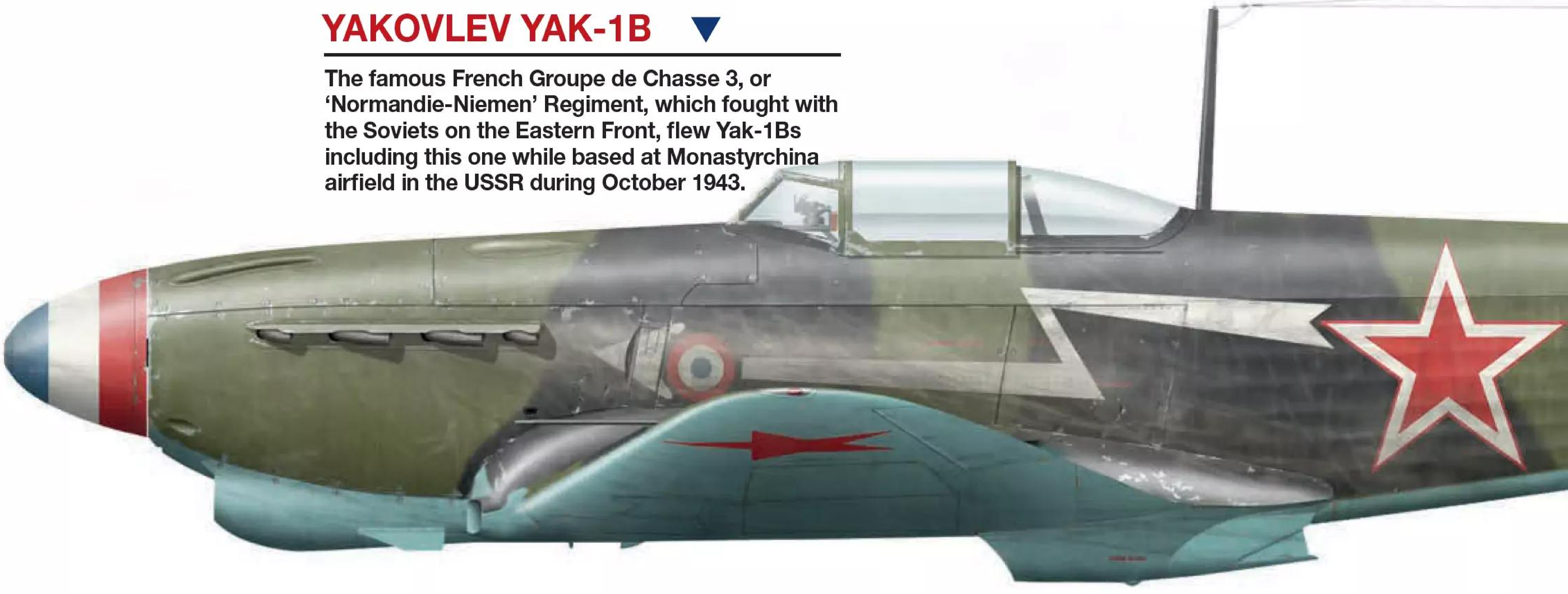
## YAKOVLEV YAK-1B

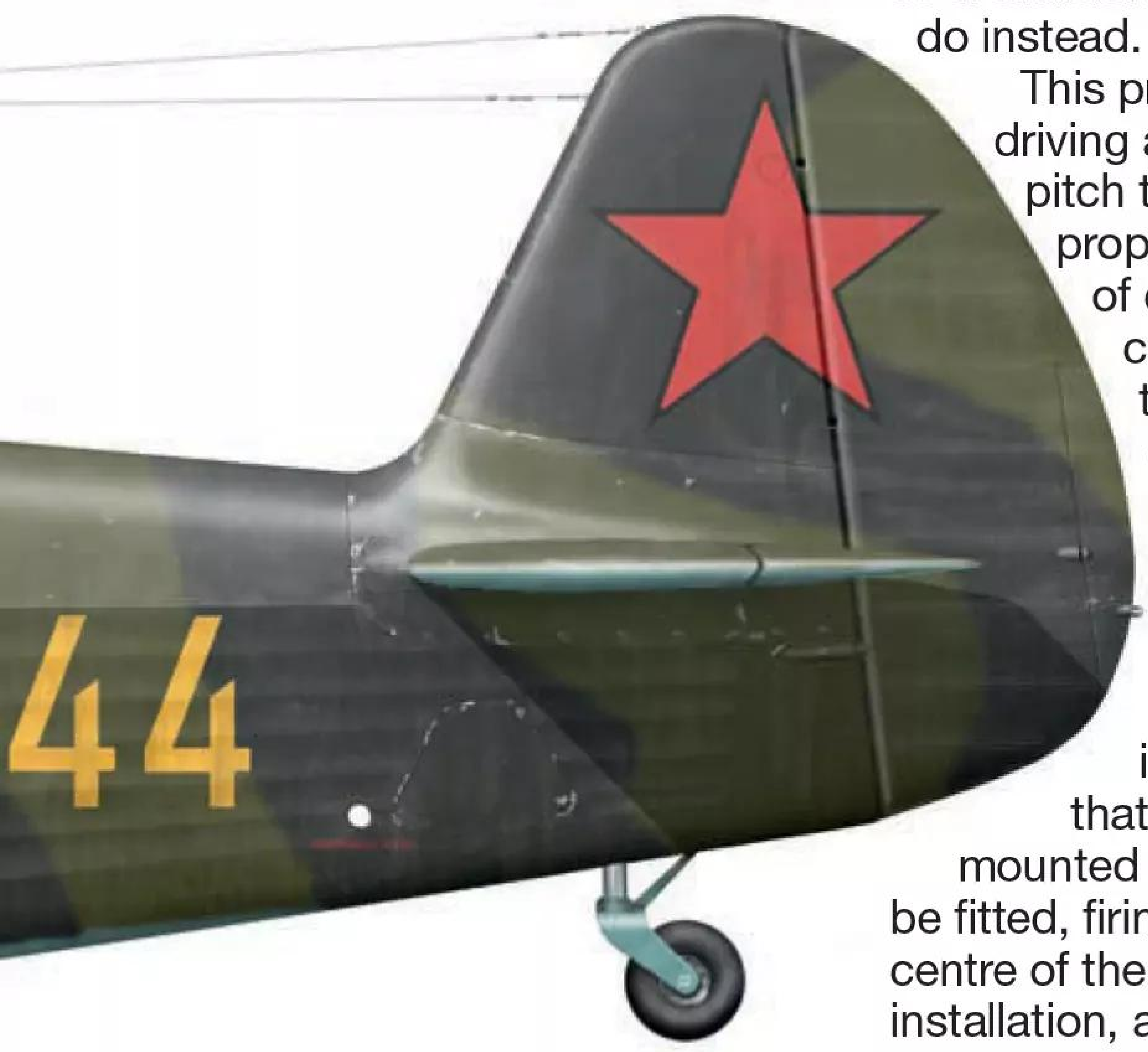
**This Yak-1B was flown by Kapitan Nikolay Aleksandrovich Kozlov of 910 IAP, based at Borisoglebsk in the USSR during February 1943. Kozlov scored 19 victories in air combat plus five shared.**

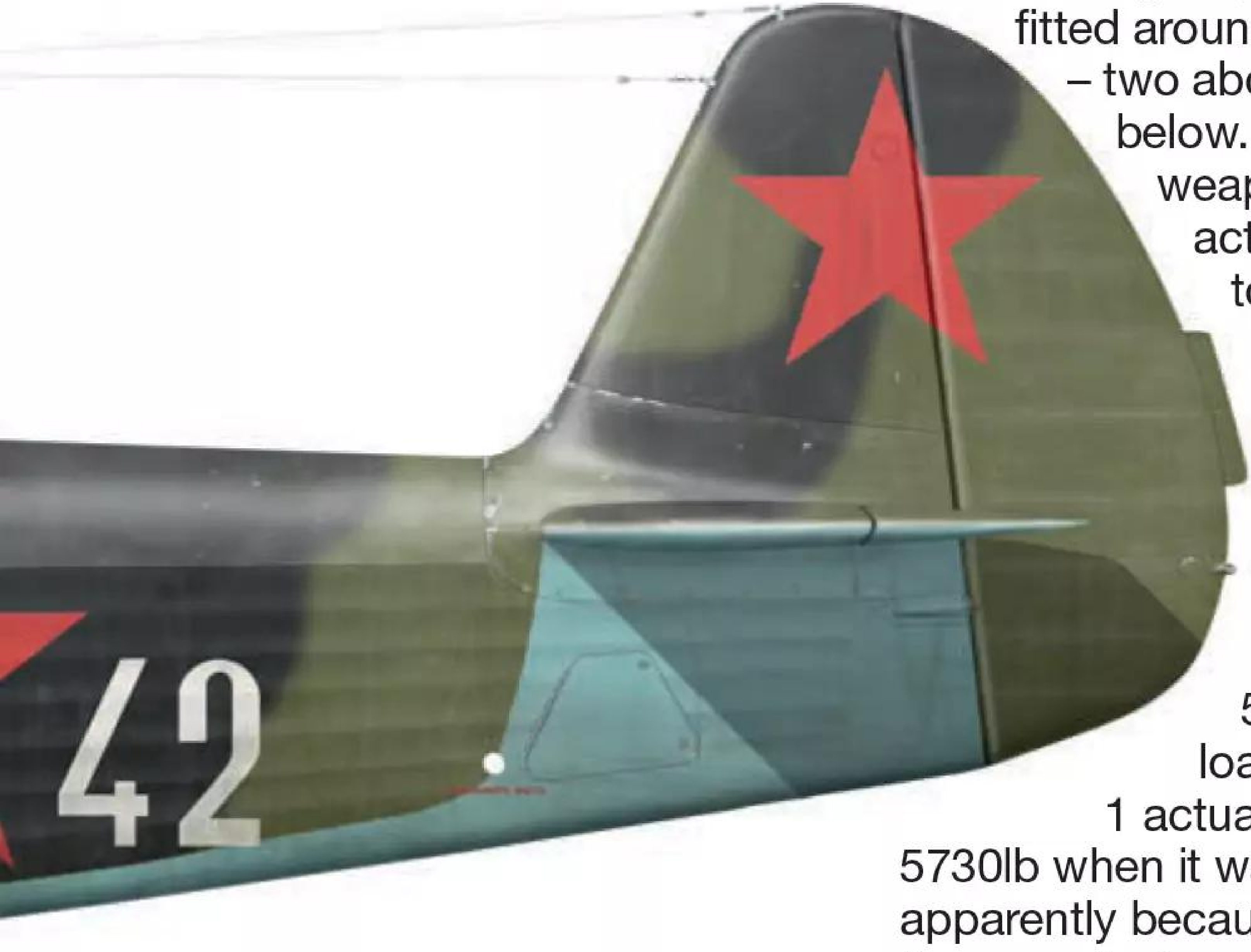


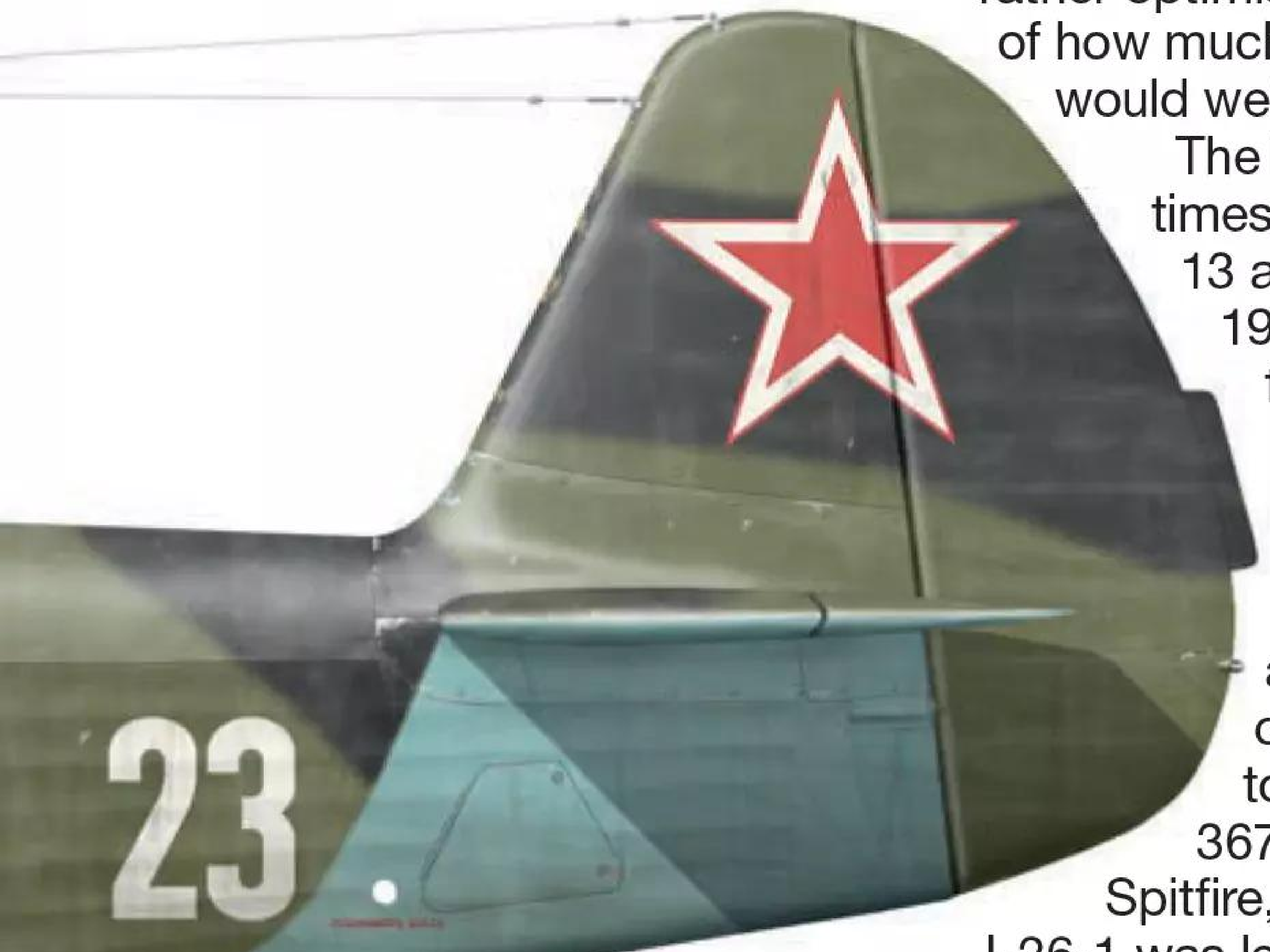
## YAKOVLEV YAK-1B

**The famous French Groupe de Chasse 3, or 'Normandie-Niemen' Regiment, which fought with the Soviets on the Eastern Front, flew Yak-1Bs including this one while based at Monastyrchina airfield in the USSR during October 1943.**









so a standard M-105P had to do instead.

This produced 1050hp, driving a metal variable-pitch three-bladed propeller. By way of comparison its contemporary, the Supermarine Spitfire Mk.I, was powered by a Rolls-Royce Merlin that produced 1030hp. The 'P' in M-105P, meant that an engine-mounted cannon could be fitted, firing through the centre of the propeller. For this installation, a 20mm ShVAK cannon was chosen. Four additional weapons, 7.62mm machine guns, were to be fitted around the engine – two above it and two below. However, no weapons were actually added to the I-26-1 prototype.

While the original design had called for a fighter weighing 5070lb fully loaded, the I-26-1 actually weighed 5730lb when it was built, apparently because many of the manufacturers responsible for producing its components and equipment had given rather optimistic projections of how much their products would weigh.

The I-26-1 flew 26 times between January 13 and March 19, 1940. Test pilots found that it handled easily and could reach a top speed of 360mph on a good day – comparing well to the Spitfire I's 367mph. Unlike the Spitfire, however, the I-26-1 was let down by shoddy workmanship. The engine was prone to serious oil leaks and could suffer from critical overheating just a few minutes into a flight.

The leading edges of its wings began to break away far short of the design's intended maximum load and structural integrity in general was poor. The undercarriage could not be retracted if the aircraft accelerated too quickly after take-off and even when the wheels were retracted they would seldom lock in place correctly.

Incredibly, series production of the I-26 was by now already under way. The first production machine rolling off the line on March 22, 1940. At this point the second prototype, I-26-2, had not even flown yet. This featured a stronger airframe but although several advanced engines were considered it was again equipped with an M-105P because none of them were ready. In addition, it was decided that the two machine guns due to be fitted below the engine would have to be deleted due to the engine's oil system being extensively modified. Loaded weight rose to 5887lb.

The I-26-2 first flew the day after the first production machine, on March 23, 1940, and during trials which lasted less than two months managed a top speed of 374mph. No diving or spin trials were conducted and the armament was not tested.

The I-26-1 was destroyed in a fatal crash on April 27, 1940, when a sharp manoeuvre resulted in the undercarriage locks coming loose, the main wheels being deployed at just the wrong moment and the pilot losing control. It had only been airborne for a total of 13 hours and nine minutes up to that point.

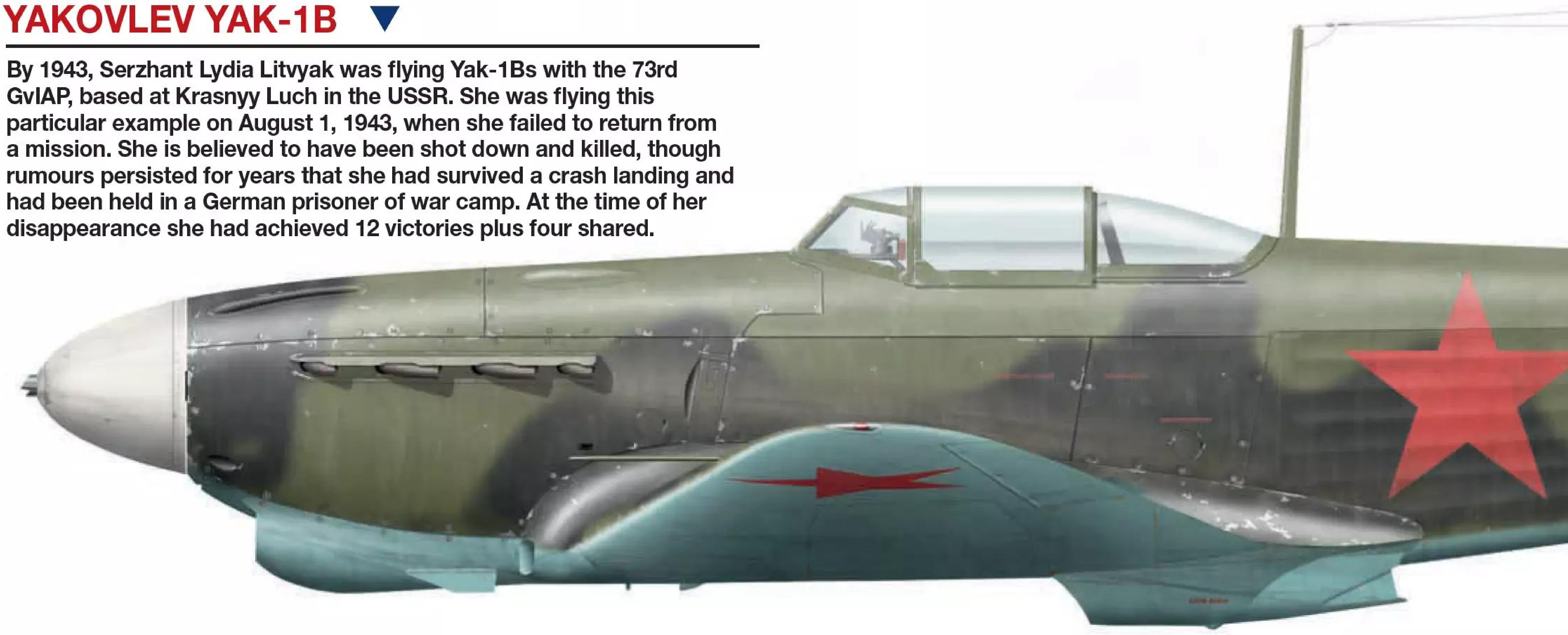
On June 1 the I-26-2 was handed over to the Soviet Air Force for acceptance trials. These determined that the aircraft offered high performance but was structurally weak and the engine continued to overheat – so rpm could not be raised too high. Most aerobatic manoeuvres were banned too for fear of structural failure.

It was also noted that the aircraft had no communications equipment whatsoever, no generator and

THE YAK-1 PROTOTYPE WAS LET DOWN BY SHODDY WORKMANSHIP

## YAKOVLEV YAK-1B

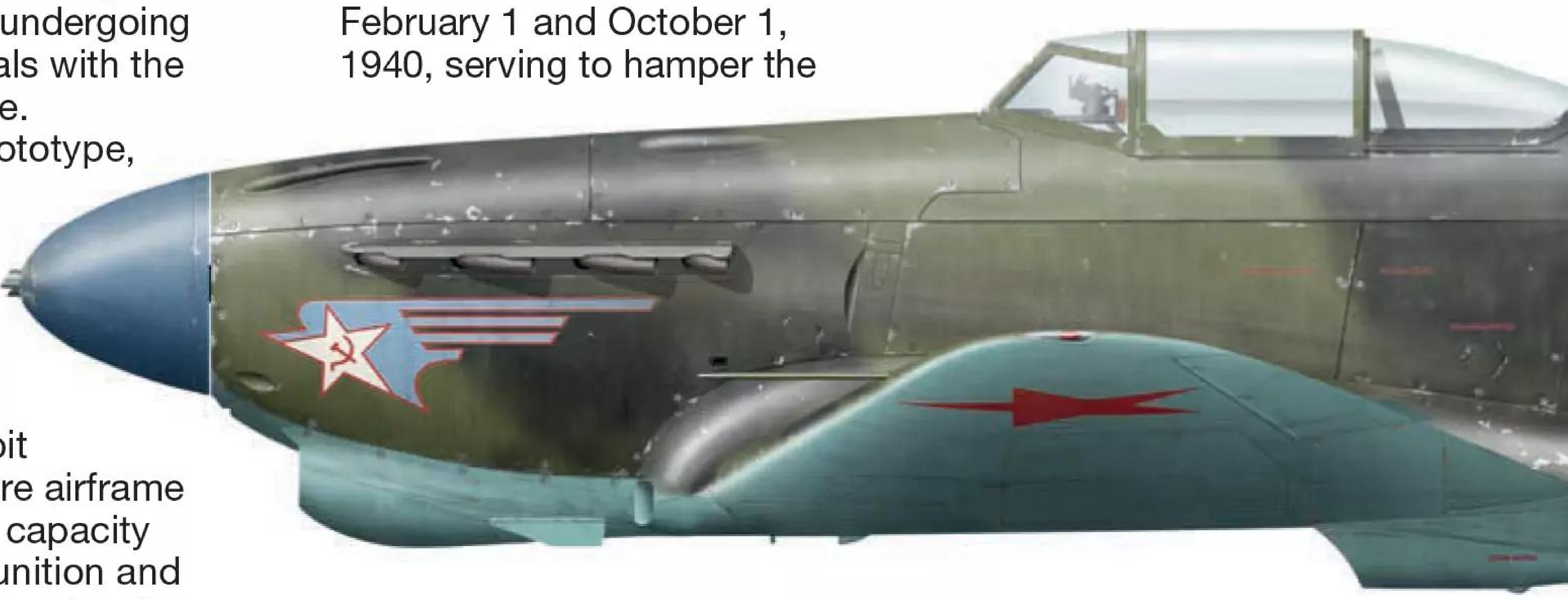
**By 1943, Serzhant Lydia Litvyak was flying Yak-1Bs with the 73rd GvIAP, based at Krasnyy Luch in the USSR. She was flying this particular example on August 1, 1943, when she failed to return from a mission. She is believed to have been shot down and killed, though rumours persisted for years that she had survived a crash landing and had been held in a German prisoner of war camp. At the time of her disappearance she had achieved 12 victories plus four shared.**



no vertical speed indicator. Its gunsight was woefully inadequate as well. By now though, a dozen production versions based on the first prototype had already been built and were undergoing acceptance trials with the Soviet Air Force.

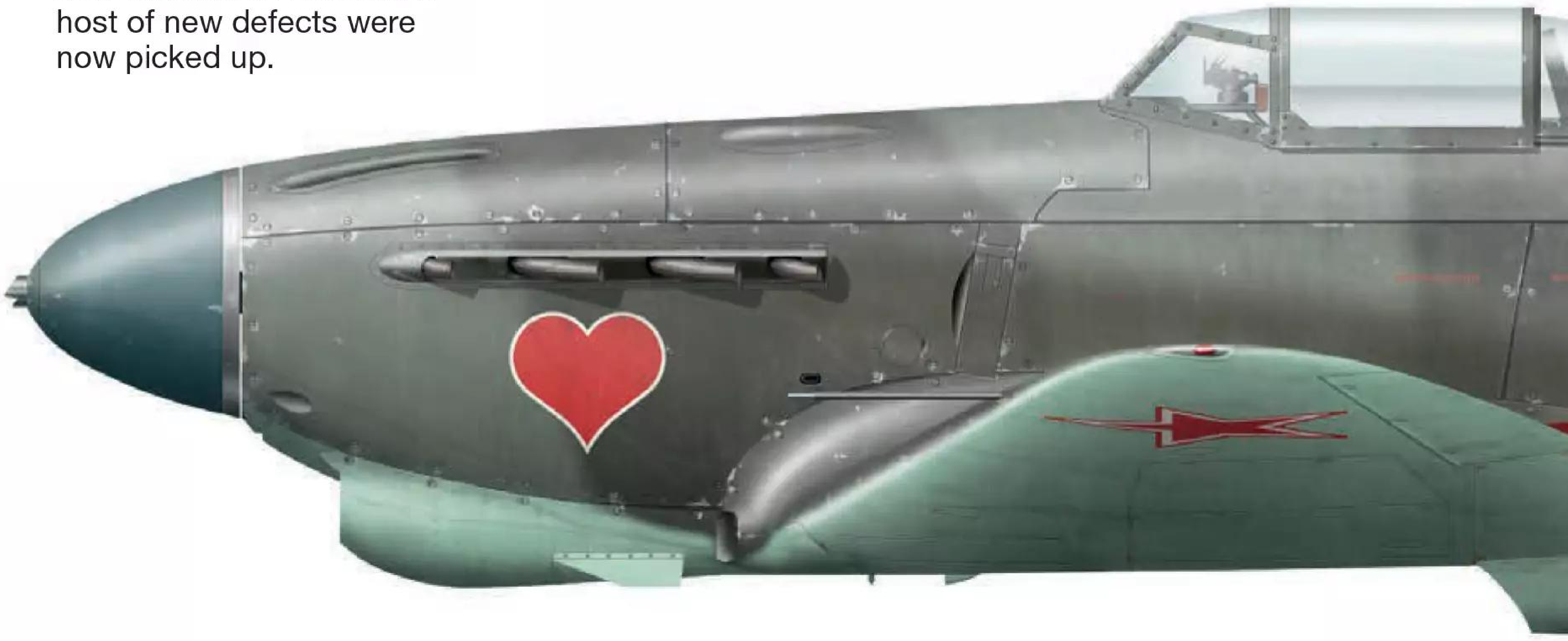
The third prototype, unsurprisingly designated I-26-3, was completed on September 17, 1940, and featured cockpit ventilation, more airframe strengthening, capacity for more ammunition and numerous further detail changes. Flight testing commenced immediately and it was determined that most of the earlier faults plaguing the type had been resolved – though all-up weight had now reached 6175lb and a host of new defects were now picked up.

The production versions were modified on the fly as the prototypes trialled different fixes and new components – these continual revisions, some 300 of them between February 1 and October 1, 1940, serving to hamper the

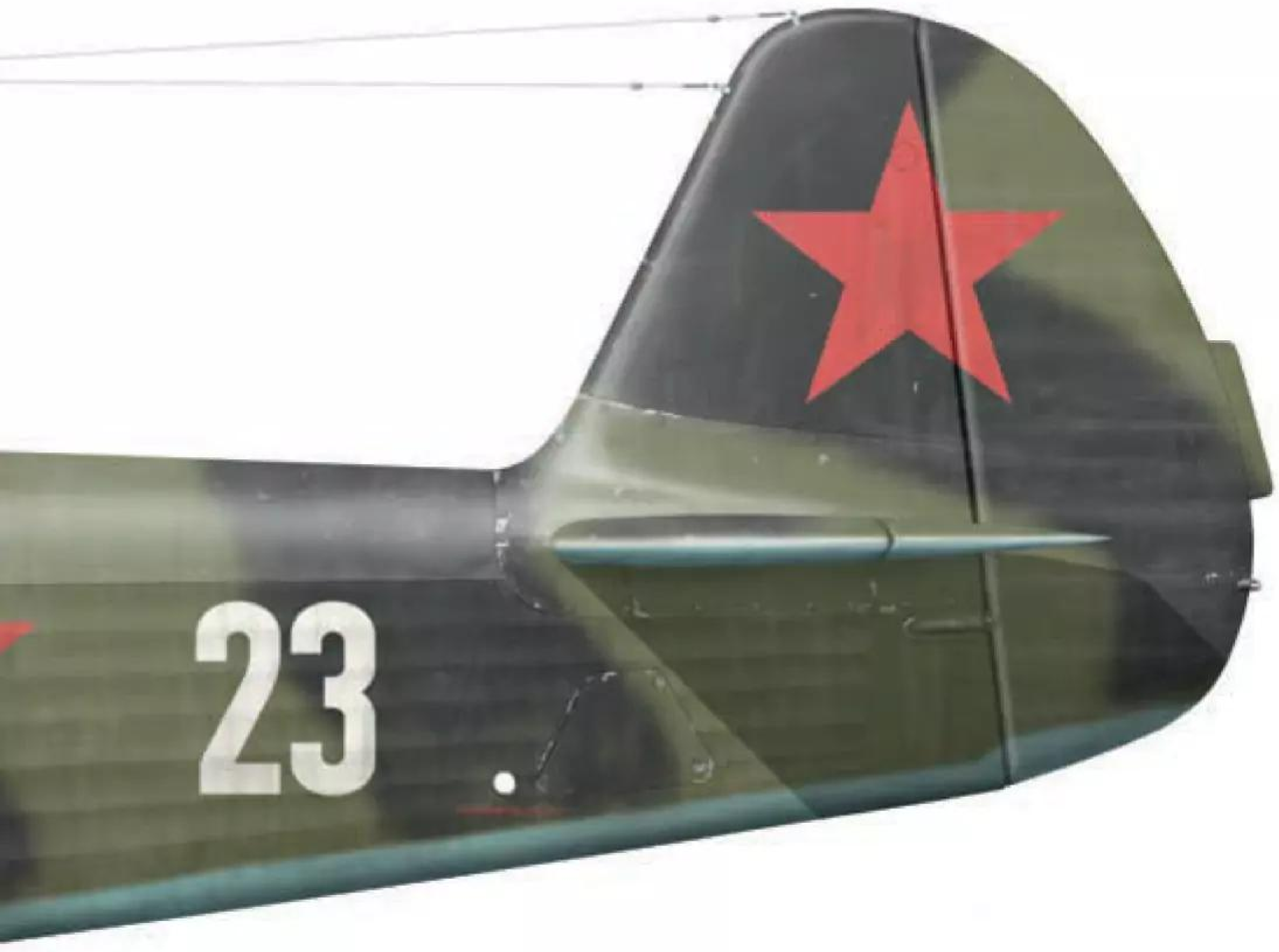


## YAKOVLEV YAK-1M

**This aircraft was flown by Starshiy Leytenant Aleksandr Alekseyevich Shokurov of the 156th IAP while stationed in Czestochowa, Poland, during the summer of 1944. Shokurov achieved 19 aerial victories.**



**BUILD QUALITY IMPROVED WITH THE YAK-1B**



overall numbers being built. Finally, in December 1940, the I-26 was officially designated the Yak-1 in honour of its originator.

By the middle of 1941, two aircraft plants were engaged in building the Yak-1, No. 303 and No. 292, each apparently working to a slightly different set of drawings – resulting in aircraft that varied in performance.

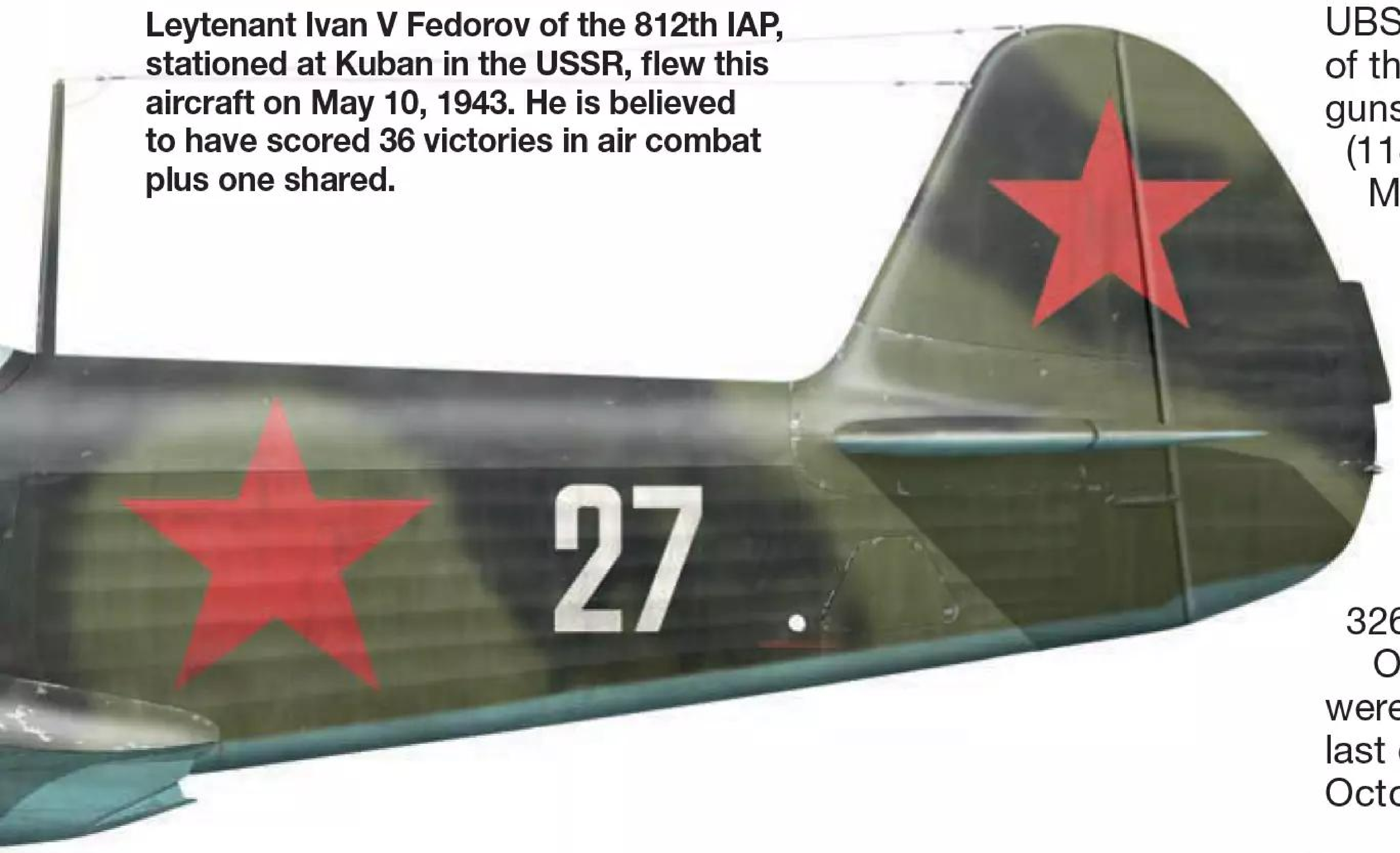
The revisions kept coming, with the aircraft's equipment and engine being continually upgraded and improved. The upgraded Yak-1B had completely replaced the Yak-1 by October 1942. This boasted an improved oil cooler, 'bubble' canopy for improved pilot visibility, a single 12.7mm UBS offset to port in place of the two 7.62mm machine guns and slightly more power (1180hp) from the improved M-105PF.

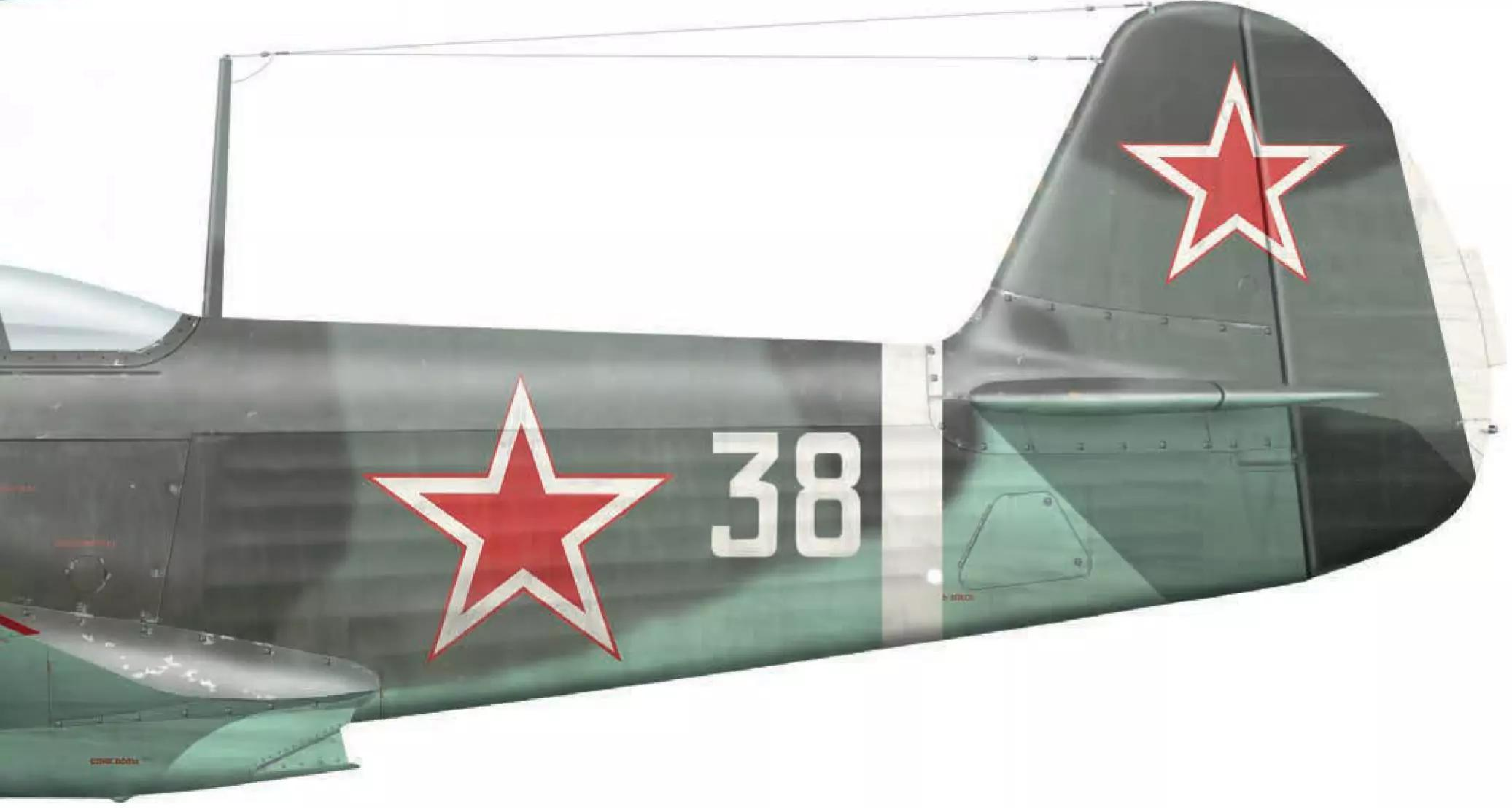
Reliability and build quality also continued to get better as production progressed. Weight continued to be a problem, however, and by the time the last Yak-1Bs were completed in 1944 top speed was only 326mph.

Overall, a total of 8667 were produced with the last one being accepted in October 1944.

## YAKOVLEV YAK-1B

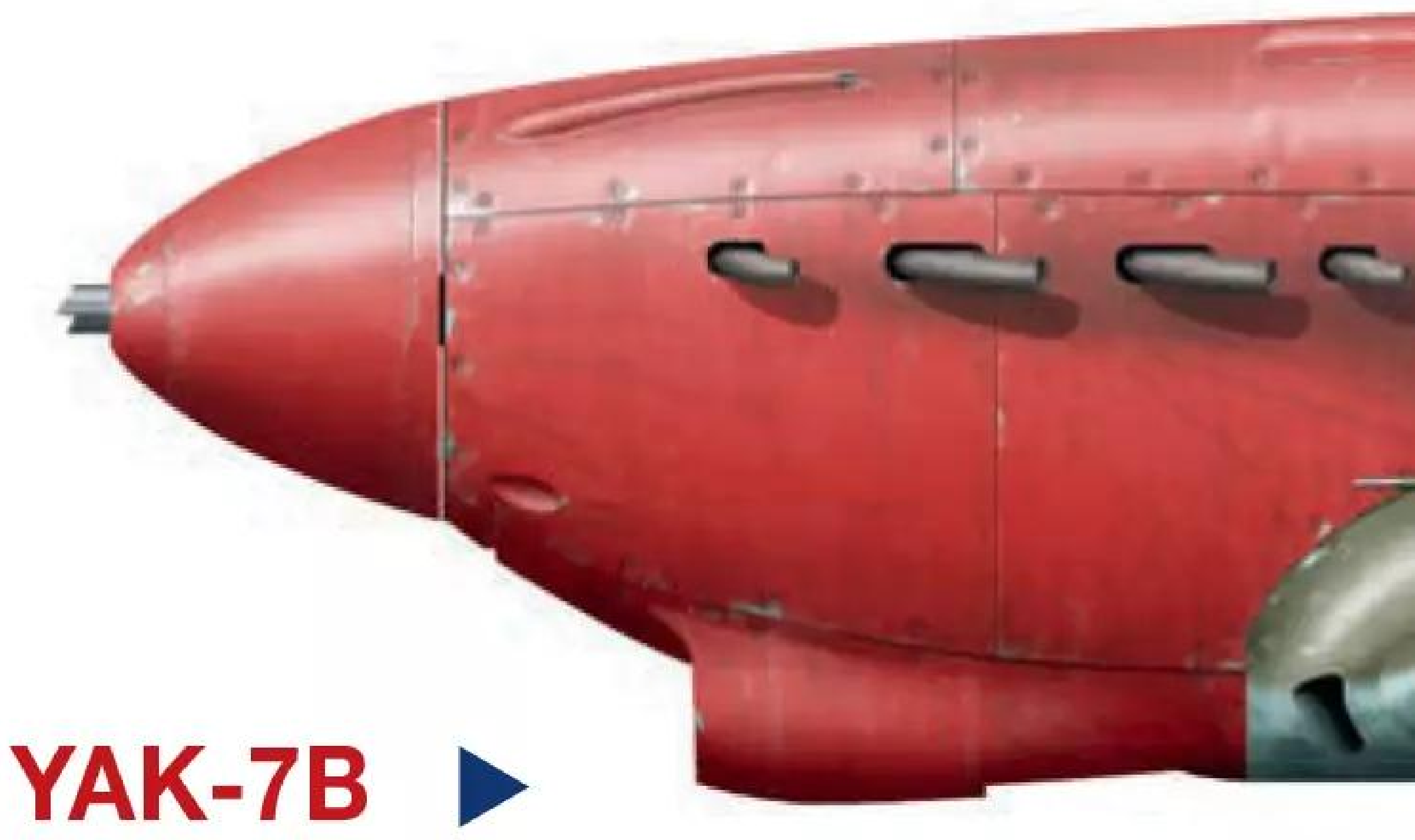
**Leytenant Ivan V Fedorov of the 812th IAP, stationed at Kuban in the USSR, flew this aircraft on May 10, 1943. He is believed to have scored 36 victories in air combat plus one shared.**





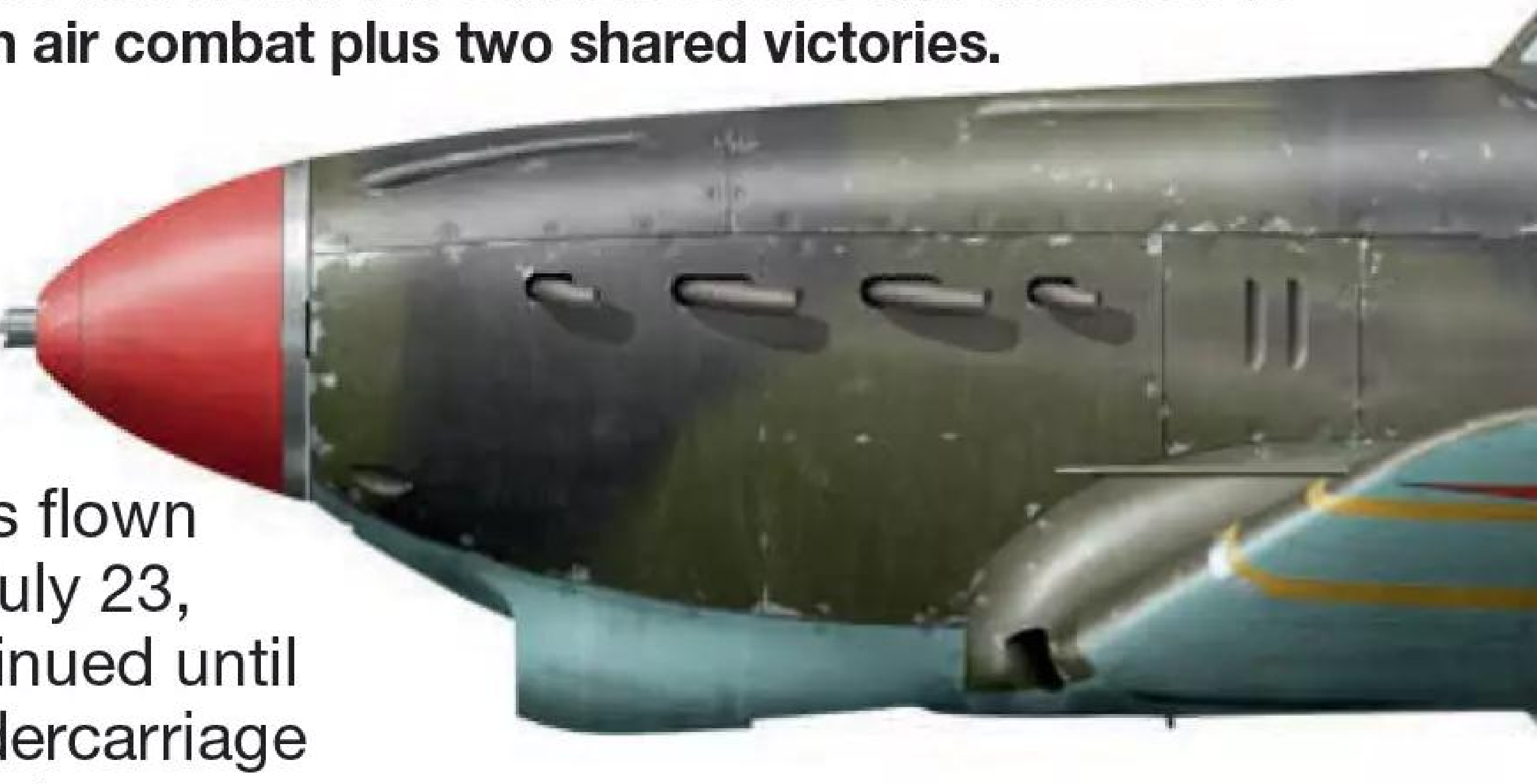
# YAKOVLEV YAK-7 AND YAK-3

**Originally designed as a two-seat trainer for pilots learning to fly the Yak-1, the Yak-7 was converted into a superior single-seater. The Yak-3 was quite simply the ultimate Yakovlev fighter of the war.**



## YAKOVLEV YAK-7B

**Starshiy Leytenant Vladimir Aleksandrovich Orekhov of the 434 IAP, based at Pichuga Airdrome, Leningrad, flew this aircraft during September 1942 when he returned to his unit after recovering from arm and leg injuries he suffered at the beginning of the year. He flew throughout 1943 and was promoted to major in early 1944. By the end of the war in Europe he had flown 420 combat sorties and achieved 19 victories in air combat plus two shared victories.**



1940-1947

The second design that made up Yakovlev's entry to the 1939 Soviet fighter competition was the I-27 trainer. As proposed this shared a great deal with the I-26 basic fighter, so when the I-26 began to progress through the development process it made sense to bring forward the I-27 too.

Detail work on it started in January 1940 and the government approved the programme two months later. Rather than retaining its original designation, the first prototype became the UTI-26-1. It was essentially an I-26, with the same M-105P engine and propeller, but with two cockpits. Each had its own sliding canopy hood and a set of flight instruments and controls.

There was no intercom however, the instructor and his student could only speak to one another by means of a crude rubber tube. In order to install the second cockpit, the I-26's wings had to be moved 100mm to the rear while the radiator went forward. Two 7.62mm ShKAS machine guns were fitted with 500 rounds apiece.

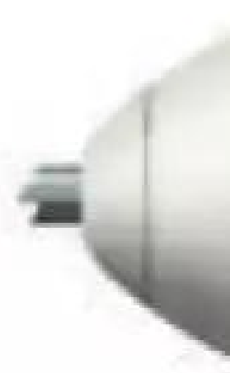
The prototype was flown for the first time on July 23, 1940, and tests continued until August when the undercarriage failed. Unsurprisingly, it suffered from all the same faults as the I-26, particularly the failing undercarriage locks and the overheating engine oil. The second prototype, completed on September 17, 1940 featured a revised undercarriage and smaller elevators to make it easier for a trainee to fly safely.

There were numerous other alterations and the centre of gravity was shifting forwards which improved stability. After Soviet Air Force acceptance trials from January 1 to February 14, 1941, the type entered full production on March 4, 1941, powered by the M-105PA, under the new designation Yak-7UTI.

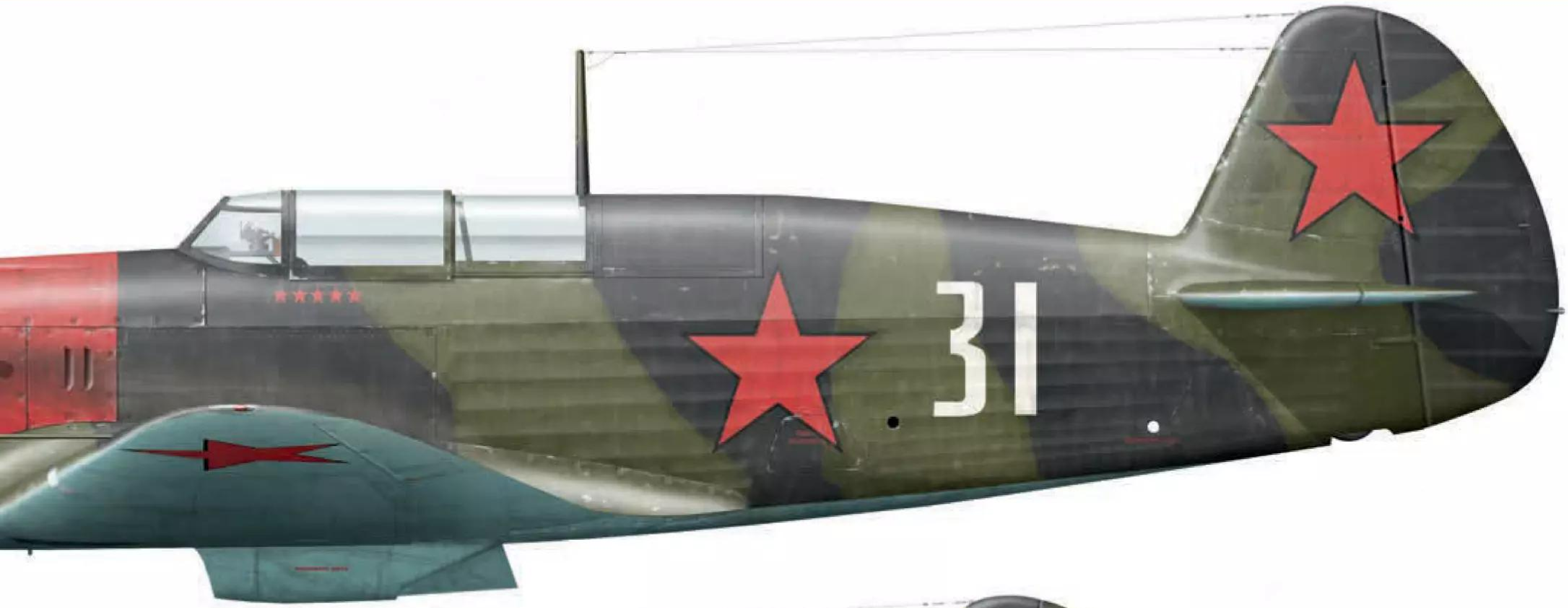
Five months later, a production model Yak-7UTI was withdrawn from the assembly line to have self-sealing fuel tanks, an armoured seat, and a 20mm ShVAK engine-mounted cannon fitted. It also received six under-wing launch rails for unguided RS-82 rockets. This was the first Yak-7.

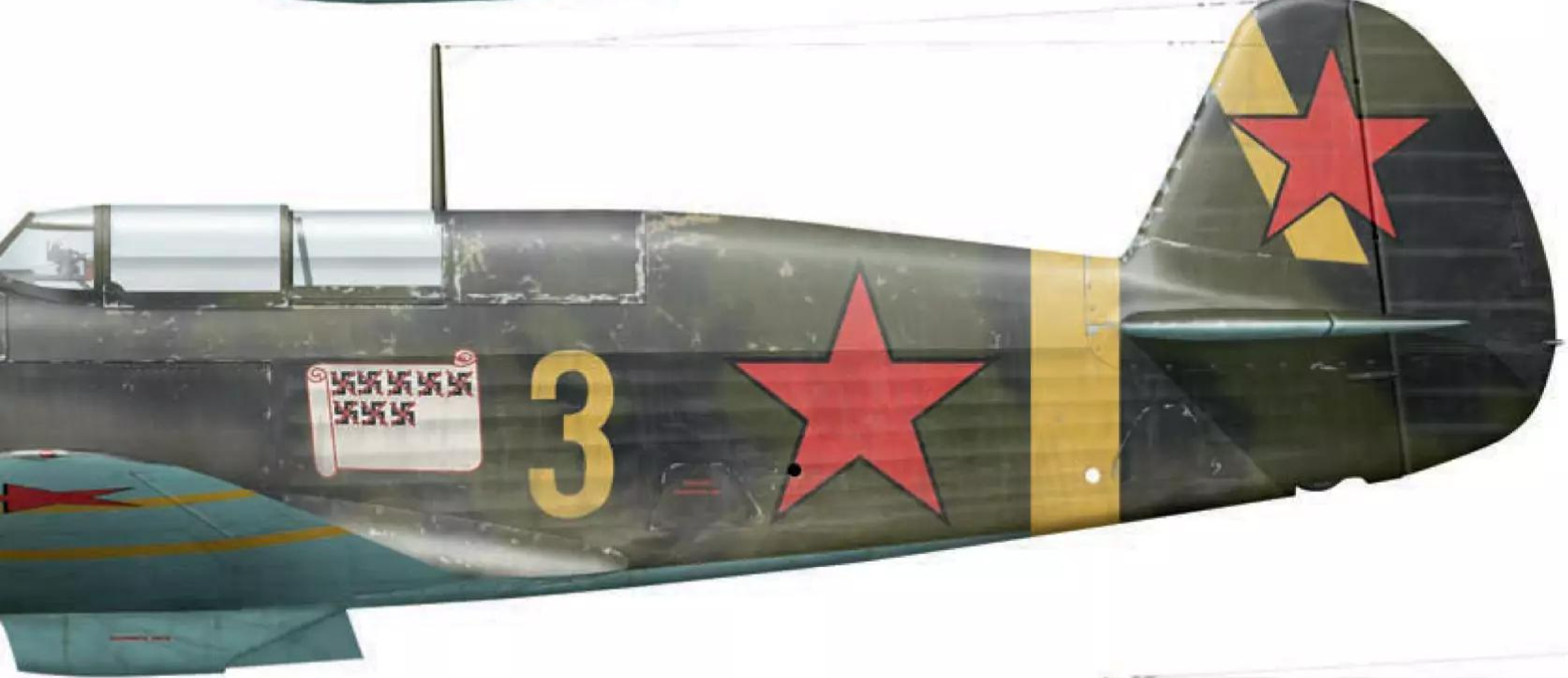
The type was quickly put into production and then into service, reports on the prototype having been extremely positive. It was easier to fly than the Yak-1, the unoccupied rear cockpit could be used for the installation of a long-range fuel tank and it was easier to repair thanks to design changes around the engine.

While its performance differed little from that of the Yak-1, the Yak-7 able to reach an unremarkable top speed of 348mph at 16,400ft, and its turning performance was marginally inferior, it was a much more stable and forgiving machine. This meant attacks on ground targets could be made with greater accuracy and it could be recovered from extreme manoeuvres with far greater ease.



Significant changes were made during 1942, the second year of Yak-7 manufacture – including the installation of a two-way radio complete with aerial mast, a semi-retractable tailwheel (it had been non-





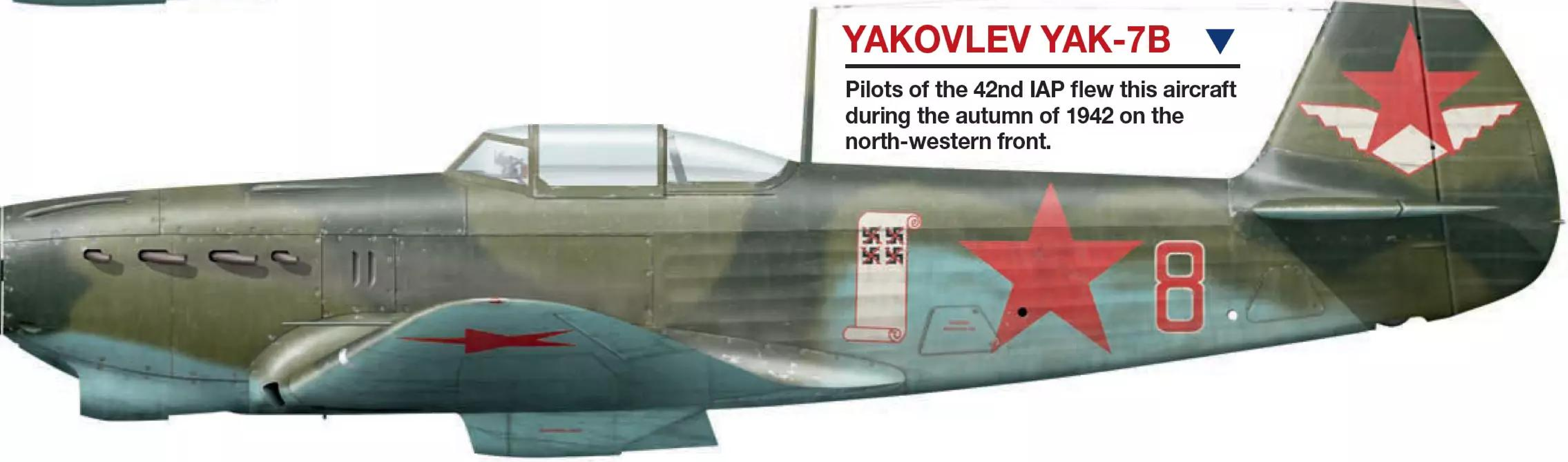
## YAKOVLEV YAK-7B

**Flying this aircraft on the Kalinin front during the spring of 1943, Starshiy Leytenant Viktor Yakovlevich Khasin of the 271 IAP became one of the top Yak aces of the war. During 700 combat sorties he achieved 23 victories in air combat plus five shared. He also destroyed eight aircraft on the ground.**

◀

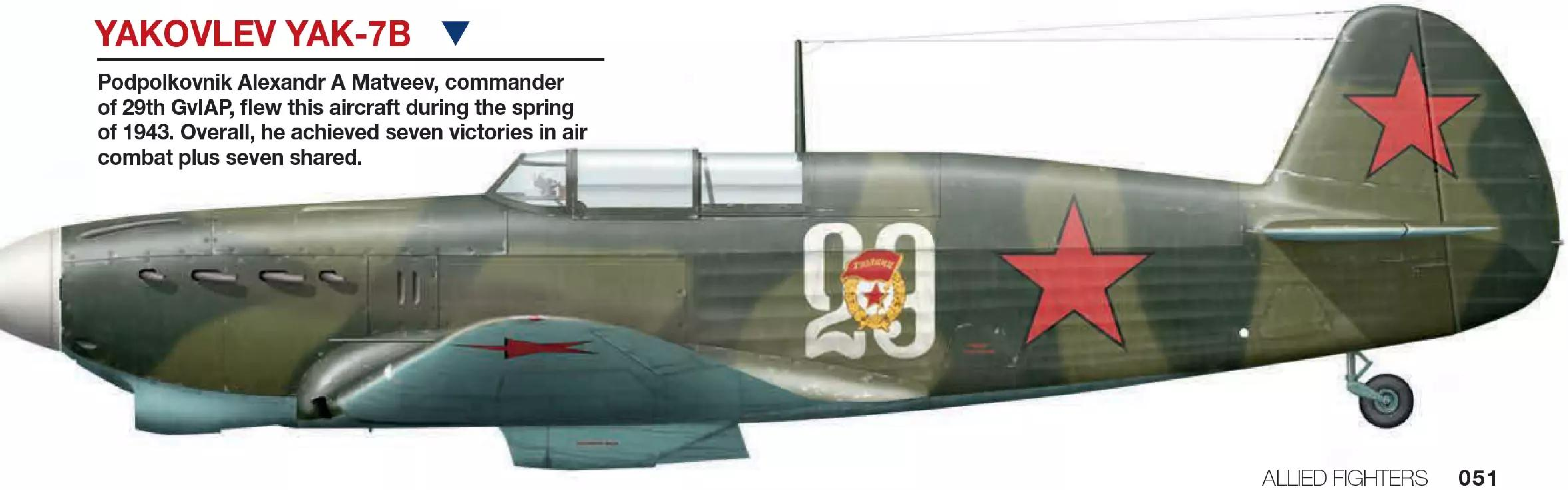
## YAKOVLEV YAK-7B ▼

**Pilots of the 42nd IAP flew this aircraft during the autumn of 1942 on the north-western front.**



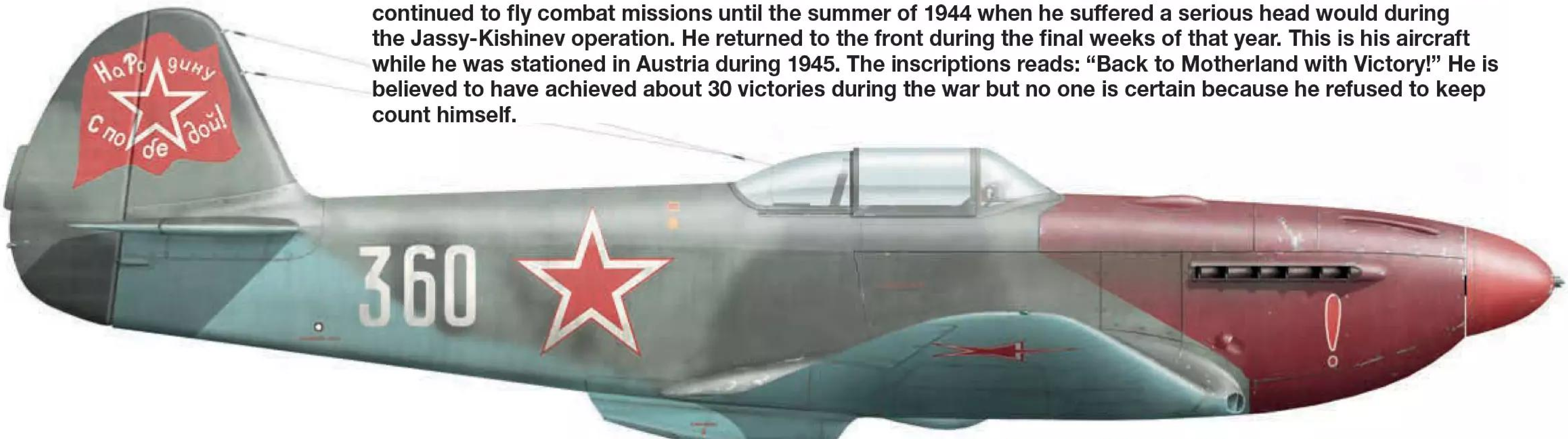
## YAKOVLEV YAK-7B ▼

**Podpolkovnik Alexandr A Matveev, commander of 29th GvIAP, flew this aircraft during the spring of 1943. Overall, he achieved seven victories in air combat plus seven shared.**



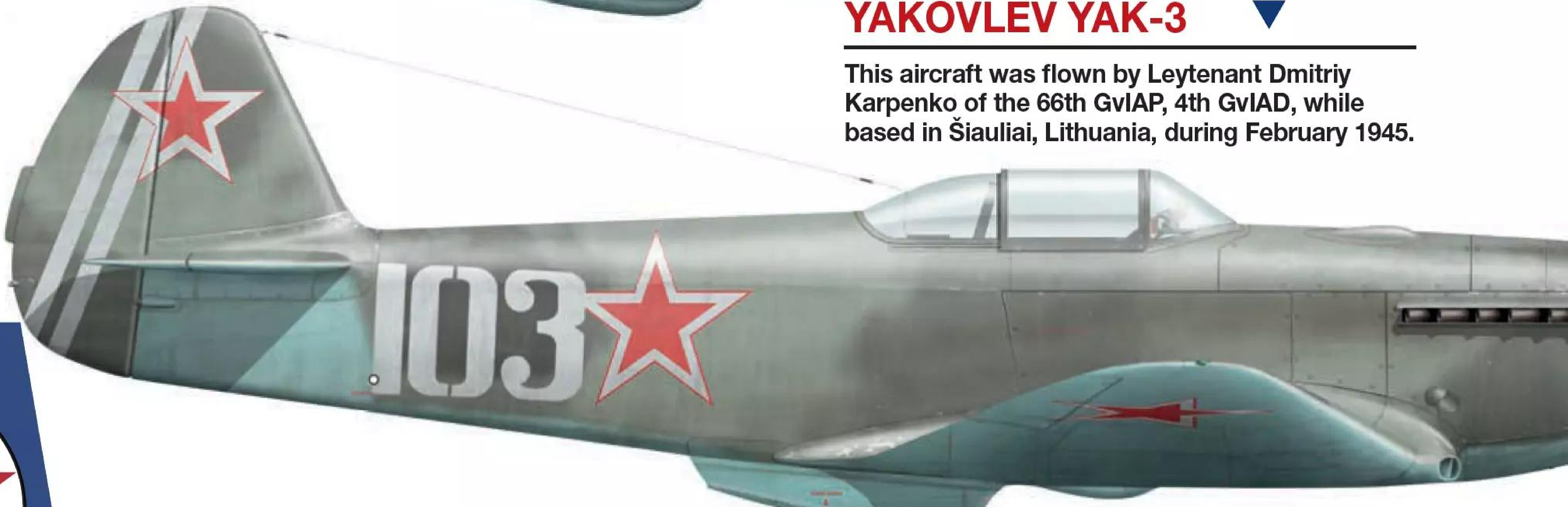
## YAKOVLEV YAK-3 ▼

Already an experienced combat pilot when the Germans invaded, Podpolkovnik Anton Dmitrievich Yakimenko continued to fly combat missions until the summer of 1944 when he suffered a serious head would during the Jassy-Kishinev operation. He returned to the front during the final weeks of that year. This is his aircraft while he was stationed in Austria during 1945. The inscriptions reads: "Back to Motherland with Victory!" He is believed to have achieved about 30 victories during the war but no one is certain because he refused to keep count himself.



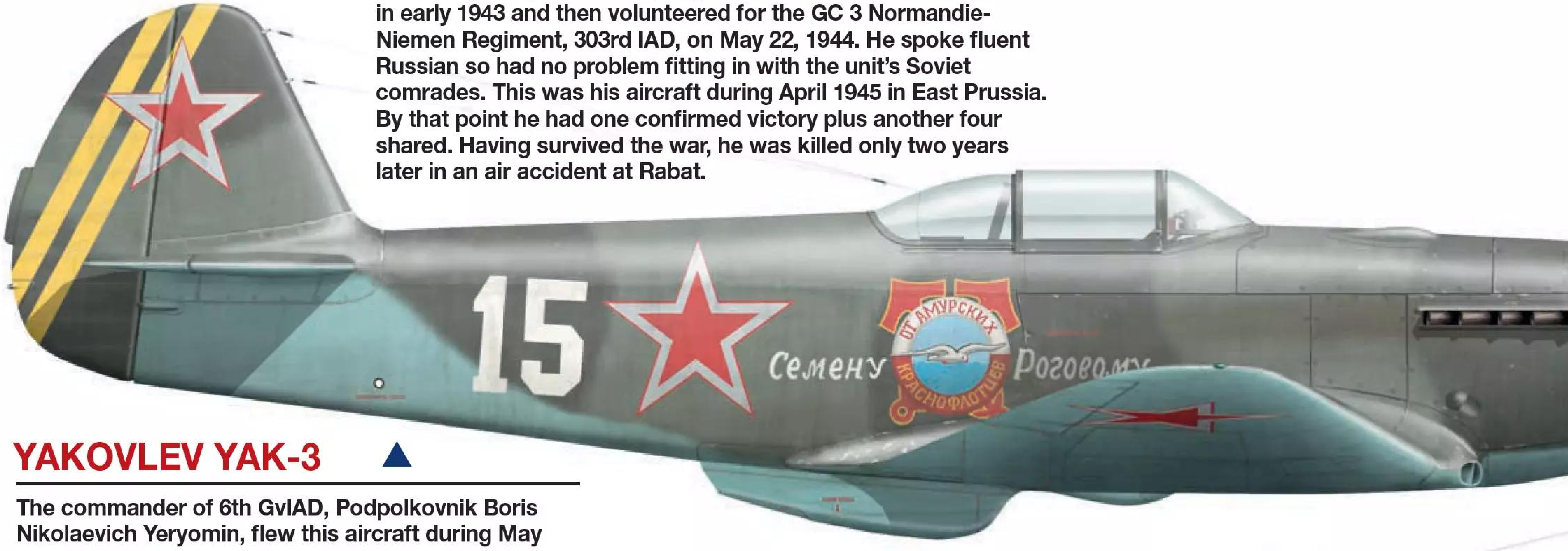
## YAKOVLEV YAK-3 ▼

This aircraft was flown by Leytenant Dmitriy Karpenko of the 66th GvIAP, 4th GvIAD, while based in Šiauliai, Lithuania, during February 1945.



## YAKOVLEV YAK-3 ►

Though he was born in Russia, Léon Ougloff moved to France with his parents when he was just one year old in 1919. He eventually became a French citizen in 1933. Having become a trained fighter pilot in 1940, he joined the Free French Air Force in early 1943 and then volunteered for the GC 3 Normandie-Niemen Regiment, 303rd IAD, on May 22, 1944. He spoke fluent Russian so had no problem fitting in with the unit's Soviet comrades. This was his aircraft during April 1945 in East Prussia. By that point he had one confirmed victory plus another four shared. Having survived the war, he was killed only two years later in an air accident at Rabat.

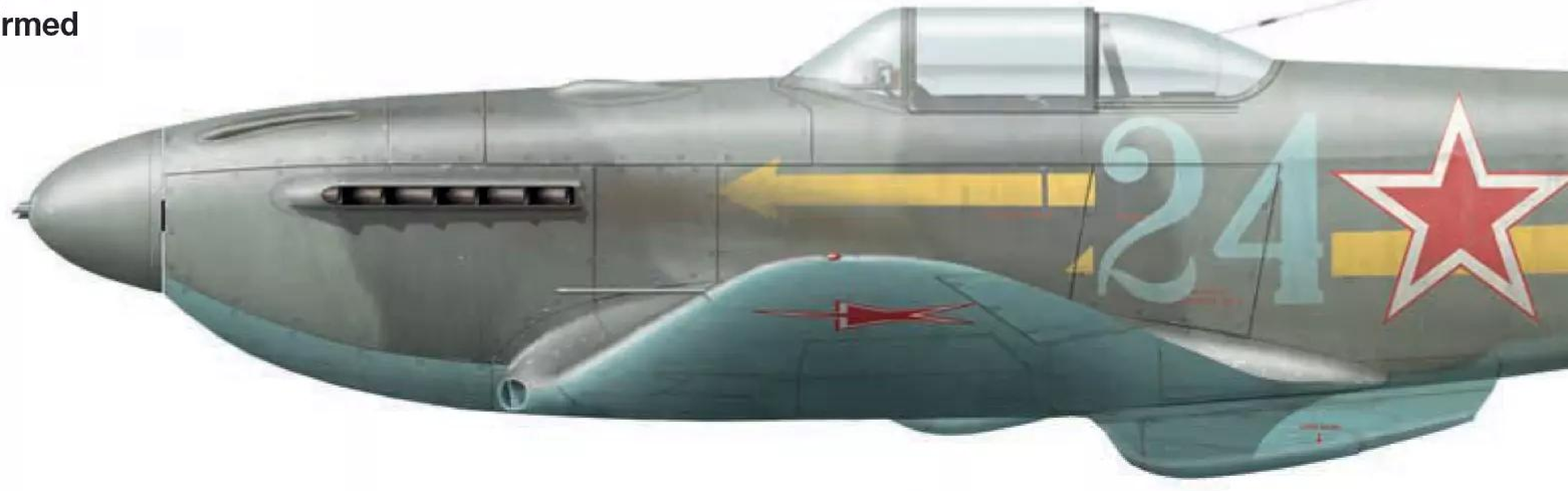


## YAKOVLEV YAK-3 ▲

The commander of 6th GvIAD, Podpolkovnik Boris Nikolaevich Yeryomin, flew this aircraft during May 1945 while based in Prague, Czechoslovakia. He completed 534 combat sorties, with 19 confirmed victories plus another three shared.

## YAKOVLEV YAK-3 ►

Pilots of the 7th GvIAP, 303rd IAD, flew this aircraft in East Prussia, Germany, during April 1945.



retractable before), fully enclosing main wheel doors, a plywood hinged hood in place of the rear cockpit canopy and ammunition belt link collectors. The latter was so that the links could be reused.

With these modifications in place, the standard Yak-7 became the Yak-7A and a total of 277 were built.

But the aircraft remained inferior to its opponents, chiefly the Messerschmitt Bf 109, in combat and further improvements were urgently needed. Work was now undertaken on aerodynamic refinements such as reshaping the carburettor air inlets and oil cooler fairing, making the tailwheel fully retractable and improving the overall surface finish.

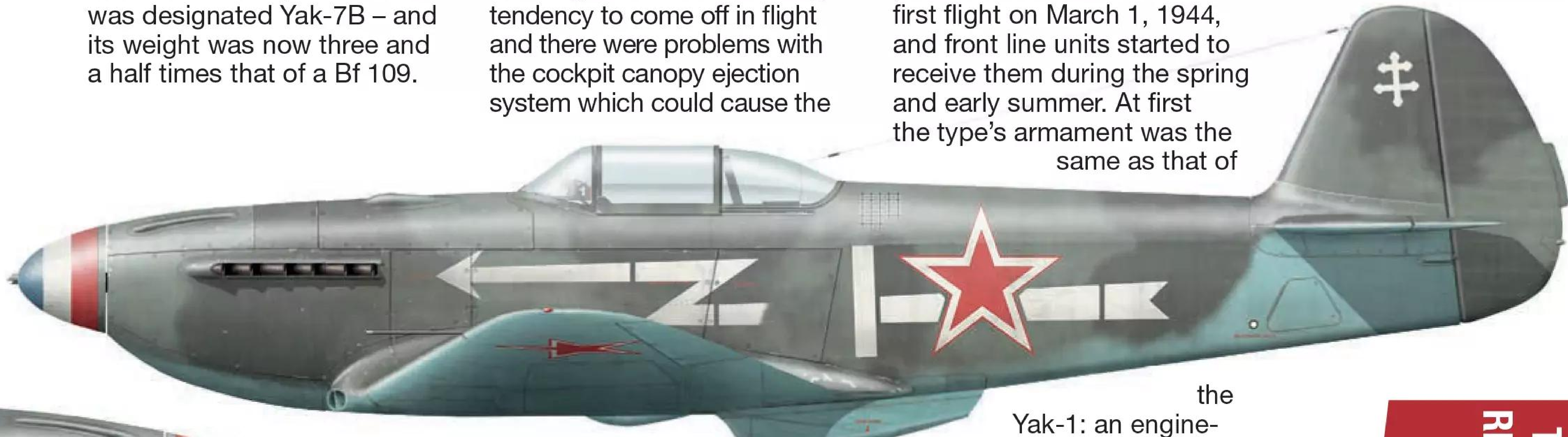
Armament was upgraded with the replacement of the two 7.62mm machine guns with two 12.7mm machine guns and the pilot's control stick was replaced with one modelled on that of the Bf 109. With all these alterations, the aircraft was designated Yak-7B – and its weight was now three and a half times that of a Bf 109.

Production began switching from Yak-7A to Yak-7B during April 1942 and from May 1942 an extra fuel tank was fitted as standard where the rear cockpit had originally been. However front line units, apparently appalled at the positioning of so much fuel in a non-self-sealing tank right behind the pilot, began to remove this feature.

That summer, a more powerful engine began to be fitted, the M-105PF. In addition, the production model Yak-7B featured alterations to lighten its structure and the back seat fuel tank was deleted.

As production of the Yak-7B progressed, the performance of new-built aircraft improved. The specification remained the same but build quality refinements allowed the basic design to realise more of its potential. During early 1943, a new bubble top cockpit canopy was introduced, finally removing all evidence of the Yak-7's origins as a trainer.

Despite the production improvements though, there were still problems. The use of new low-grade adhesives meant the wing skin had a disturbing tendency to come off in flight and there were problems with the cockpit canopy ejection system which could cause the canopy to warp or come off during a dive.



Efforts to resolve these and other issues would be taken up with the next sequential developments of the family – the Yak-9 and the Yak-3.

The Yak-3 was a successful attempt to take all the very best features of preceding models – the Yak-1, Yak-7 and Yak-9 – and put them all together in a single aircraft.

During September 1942, efforts began to create a lightened version of the Yak-1 – the Yak-1M. This incorporated all of the improvements that had been made to the Yak-1 up to this point, including a bubble canopy, and weight was indeed reduced significantly. The Yak-1M's wing had a smaller surface area and the oil cooler was moved from the aircraft's chin to the wing roots.

A prototype was built and tested 1943 with this configuration, then a second was constructed with plywood rather than fabric covering the rear fuselage. It also had a mastless radio antenna, a reflector gunsight and improved engine cooling. It was shown that the Yak-1Ms had exceptional performance – particularly their climb rate – and the type was ordered into series production as the Yak-3 in October 1943. It was to take the place of the Yak-1 on production lines.

Each Yak-3 took significantly longer to build than a Yak-1, however, since the surface finish of the aircraft had to be completed to a very high standard. The first production Yak-3 made its first flight on March 1, 1944, and front line units started to receive them during the spring and early summer. At first the type's armament was the same as that of the Yak-1: an engine-mounted MP-20 cannon and a single UBS machine gun, but this was soon replaced with a configuration which added a second UBS.

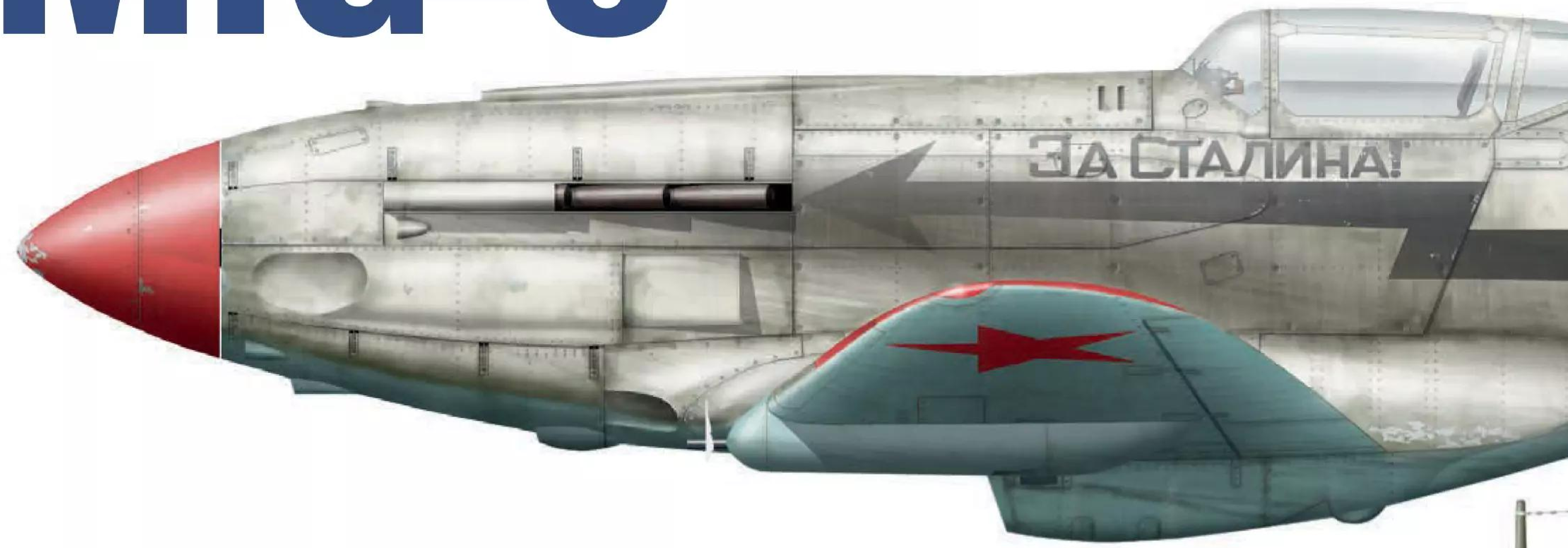
Pilots responded well to the Yak-3 – despite the usual Soviet fighter teething problems its superior build quality allowed its latent performance to shine through. It was very small, agile and very fast at low altitude and this combination of attributes made it superior even to the best of the Luftwaffe's fighters on the Eastern Front.

A total of 4848 Yak-3s were built overall. ●

THE EXCELLENT YAK-3 FINALLY REALISED THE TYPE'S POTENTIAL

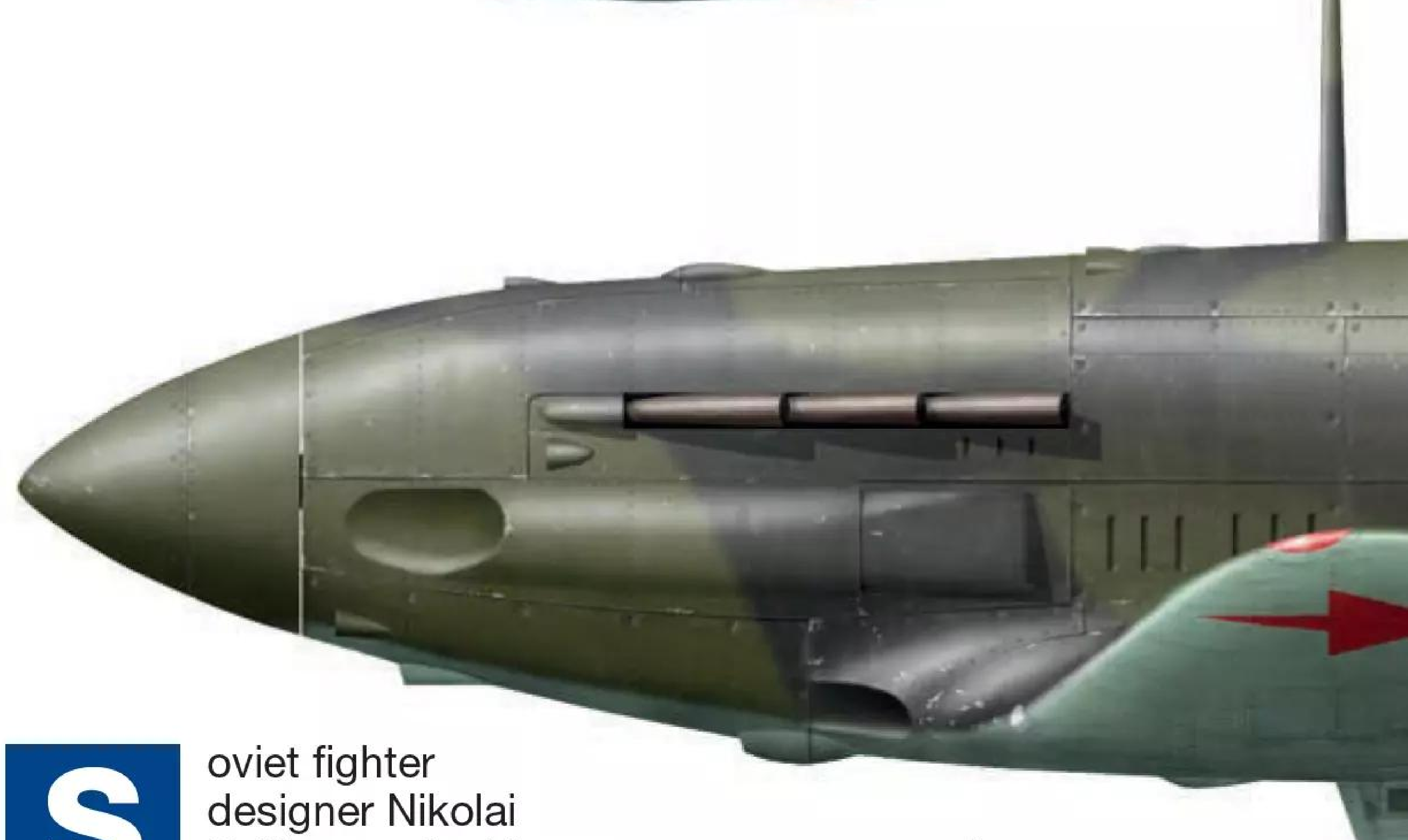
# MIKOYAN-GUREVICH

# MIG-3



### MIKOYAN-GUREVICH MIG-3 ▶

**Muscovite Kapitan Sergey Nikolayevich Polyakov, commander of the 7 IAP, flew this MiG-3 in defence of Leningrad during September 1941. He converted to the Il-2 ground-attack aircraft shortly afterwards and had flown 42 combat missions all together when, on Christmas Eve 1941, he flew a U-2 liaison biplane right into an ongoing German air raid. He was shot down and killed.**



1940-1945

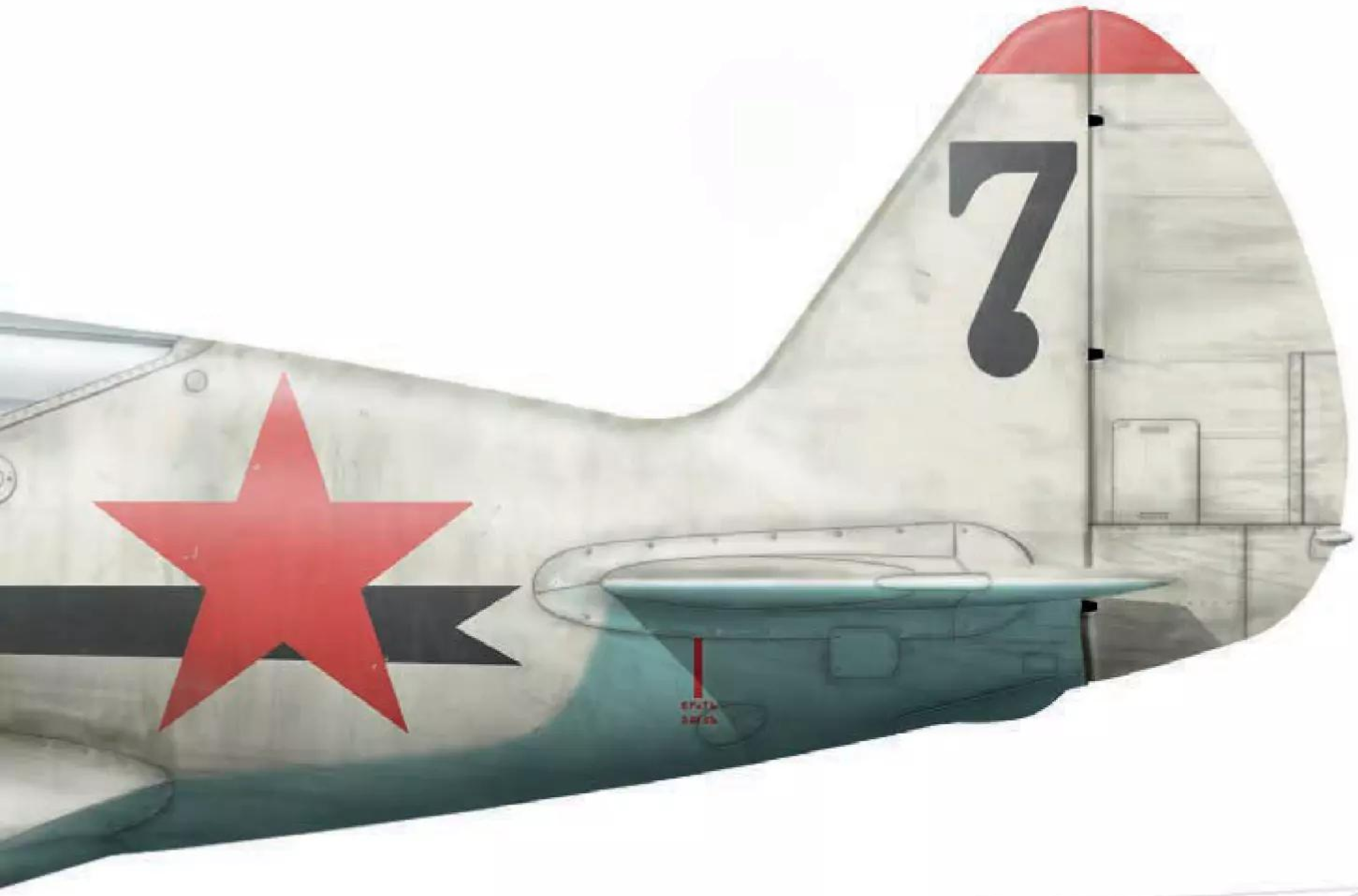
**Looks to die for and a decent turn of speed at the right altitude were not enough to make the MiG-3 a successful fighter. It was available in numbers when the German invasion of the Soviet Union began but proved to be no match for the Messerschmitt Bf 109.**

Soviet fighter designer Nikolai Polikarpov had been largely responsible for the successful I-16 design in 1931, despite having nearly been executed as a traitor to the people less than two years earlier, but the type's most advanced development, the I-180, was an abysmal failure.

The first prototype crashed during its maiden flight on December 15, 1938, with famous test pilot and Hero of the Soviet Union Valery Chkalov at the controls. He was killed and Polikarpov was held at least partially responsible.

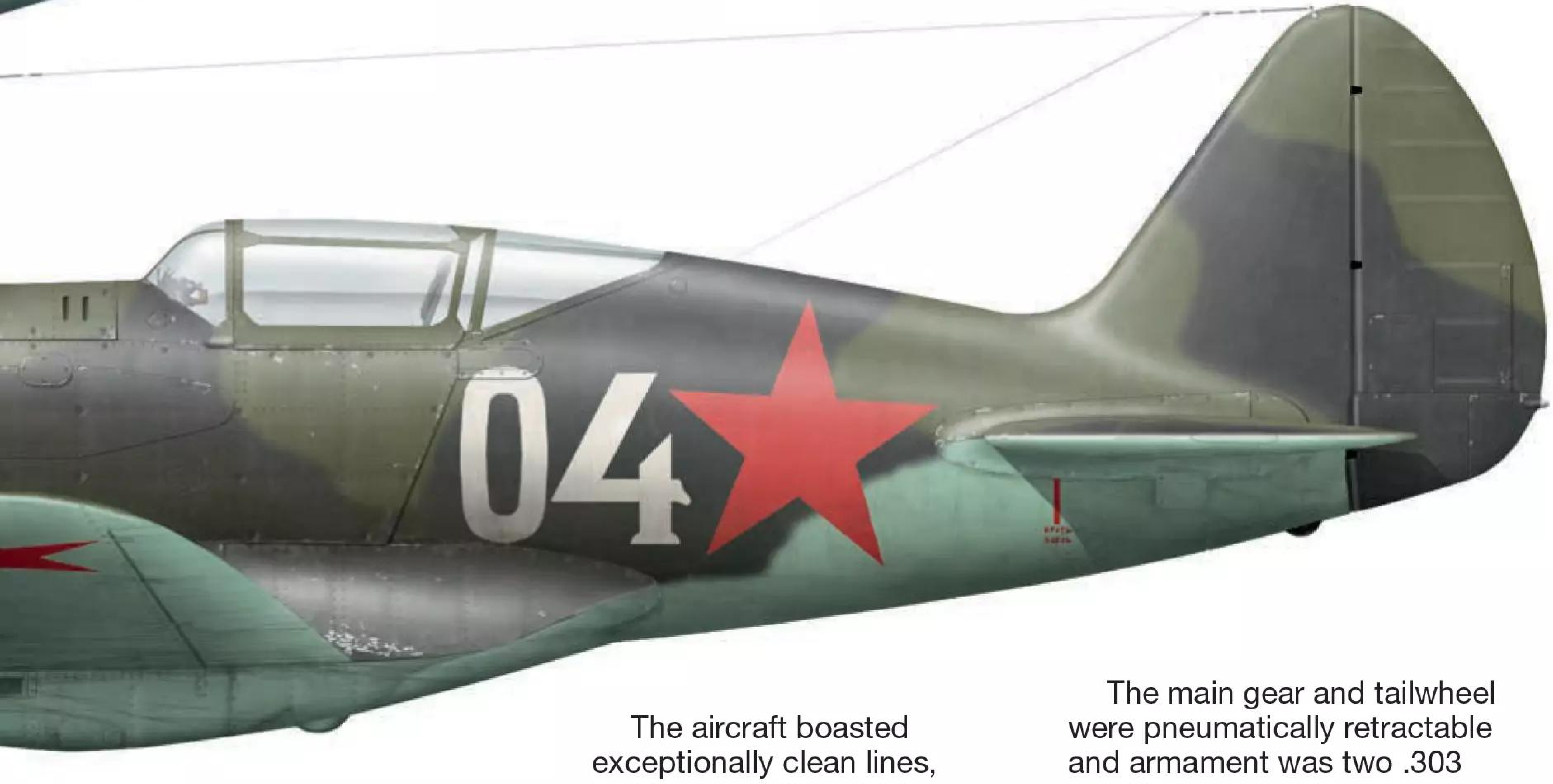
Even so, a few months later Polikarpov was able to commence work on a new monoplane fighter with a liquid-cooled inline engine, as opposed to the I-16's air-cooled radial. This was codenamed Samolyot 'Kh' and good progress was made until the designer was sent to Germany as part of a trade delegation. Returning home in November 1939, he found that he had been displaced as head of his own design bureau by well-connected young engineer Artyom Mikoyan.

Shortly thereafter, Polikarpov was effectively ousted entirely but work continued on the Samolyot 'Kh' in the hands of Mikoyan



## MIKOYAN-GUREVICH MIG-3 (LATE SERIES)

**The slogan 'For Stalin!' appeared on many Soviet aircraft during the war, including this one flown by Lieutenant A V Shlopov of the 6th IAK, Moscow air defence, Moscow, during the winter of 1941-1942. Shlopov scored three victories in air combat plus five shared.**



and some of Polikarpov's former staff including Mikhail Gurevich and Vadim Aleksandrovich Romodin.

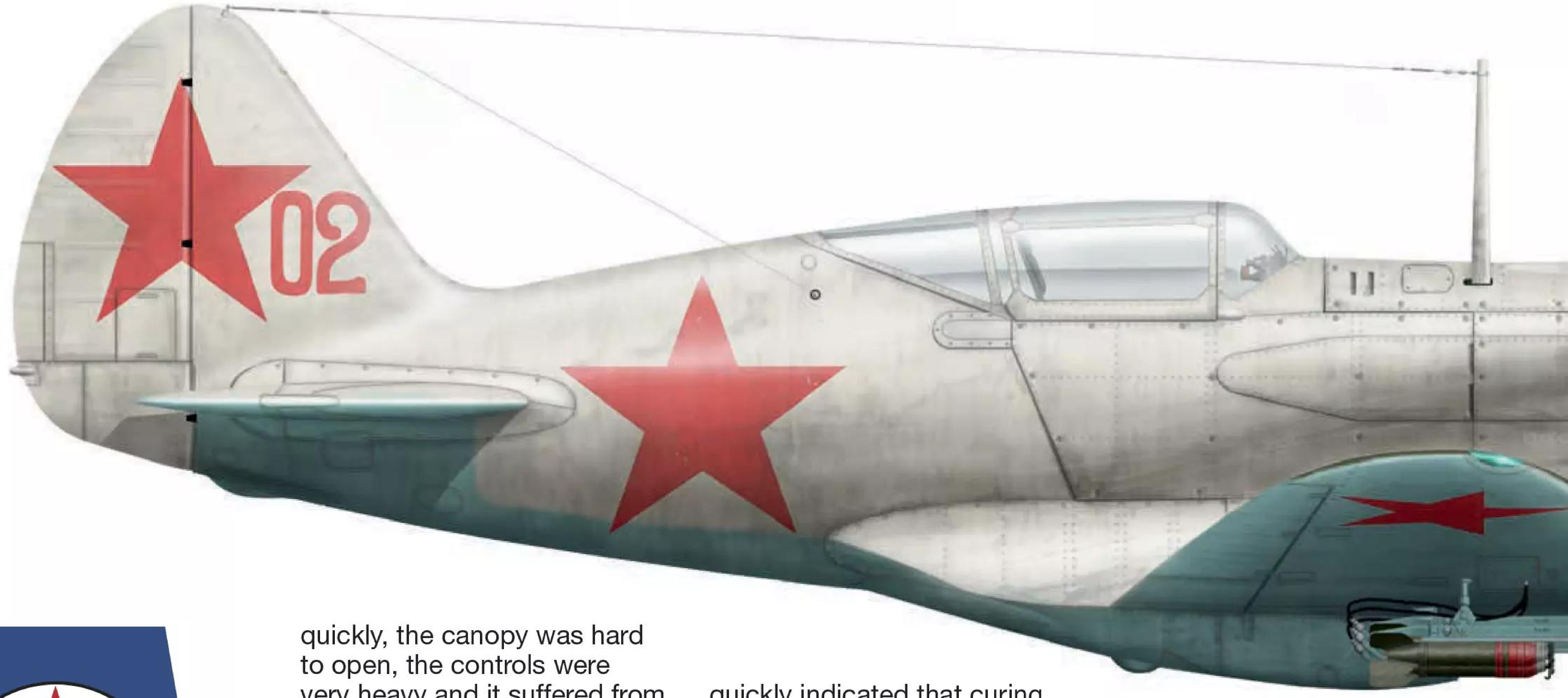
The Samolyot 'Kh' was submitted for the Soviet government's 1939 fighter competition under a new name, the I-200, and construction of a mock-up was ordered on Christmas Day 1939. Once built, this met with immediate approval and construction of three prototypes began in early March 1940.

The aircraft boasted exceptionally clean lines, looking more like a high powered racer than a fighter, though its engine was the 1200hp AM-35A rather than the still-in-development 1400hp AM-37 that it had been designed for. Most of the I-200 was made of wood, though the wing centre section was metal and the forward fuselage was made of welded steel tubes covered with a duralumin skin. The water radiator was positioned beneath the cockpit, well towards the rear of the aircraft, and there were three exhaust pipes on either side.

The main gear and tailwheel were pneumatically retractable and armament was two .303 machine guns and a .50 calibre machine gun all above the engine, firing through the propeller.

Early tests demonstrated the I-200's stunning potential – it achieved a top speed of 404mph on May 24, 1940 – and after all three prototypes had been constructed, series production began on May 31, 1940.

Unfortunately, the type's high performance came at a price: it was hard for even experienced pilots to fly. Taxying visibility was poor, the cockpit became very hot very

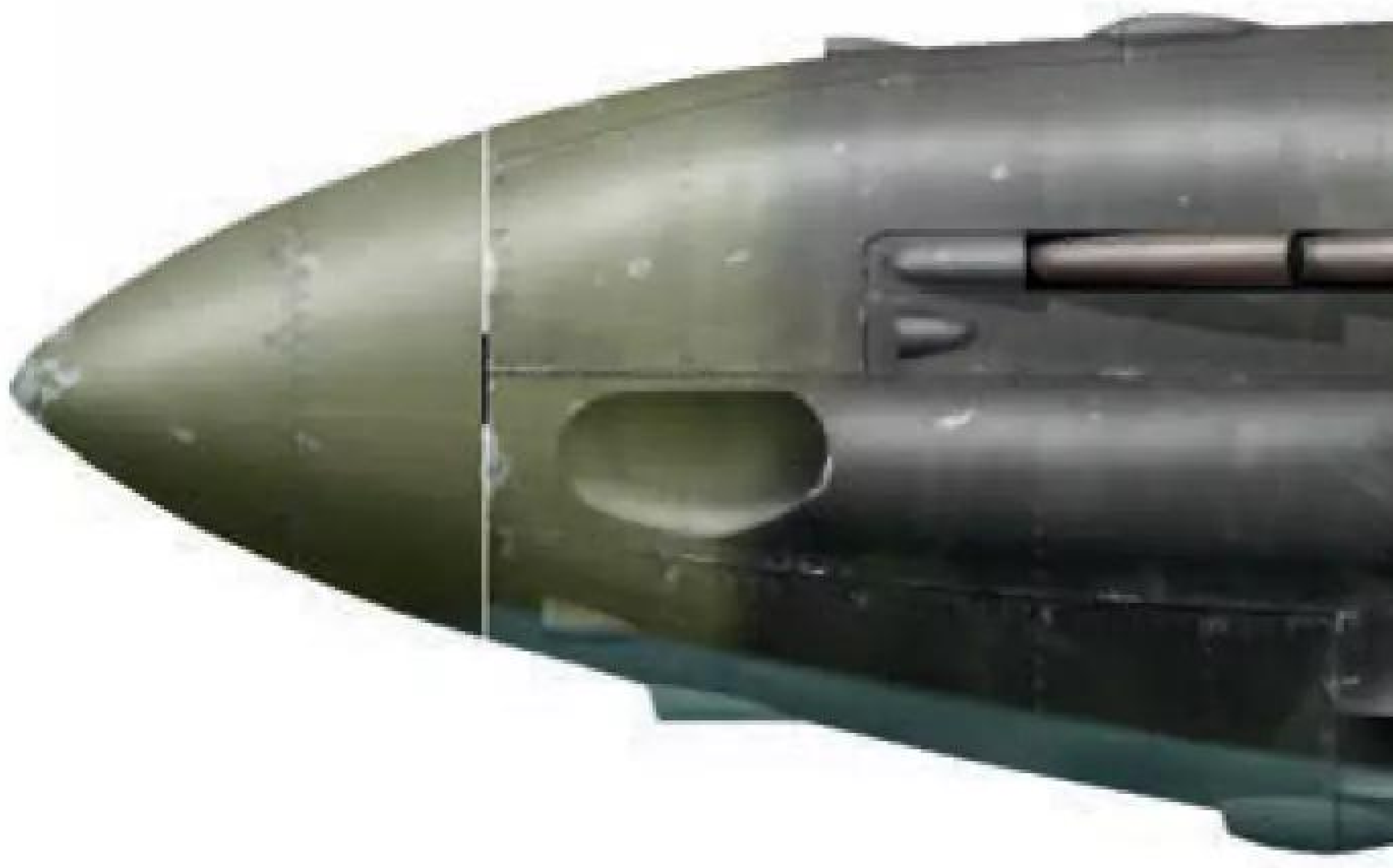


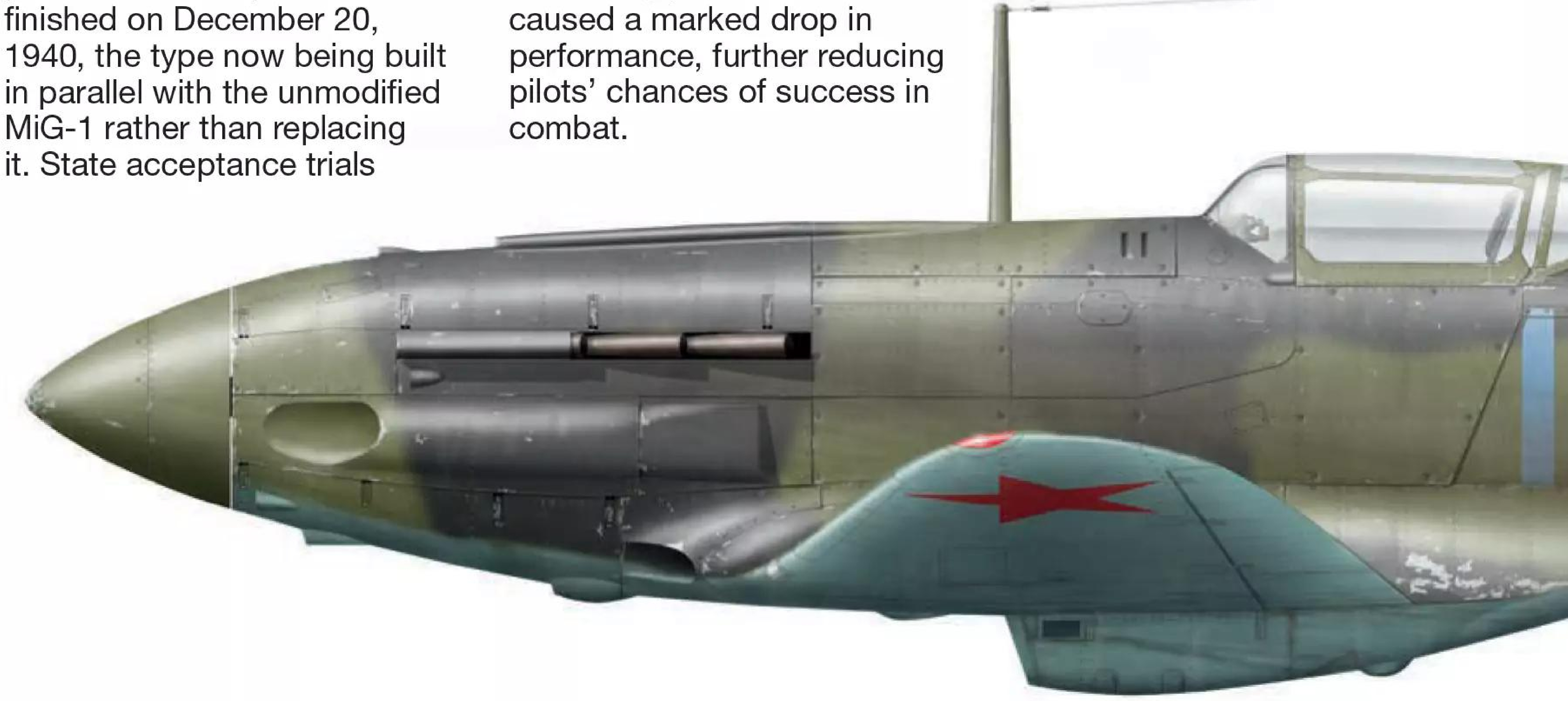
quickly, the canopy was hard to open, the controls were very heavy and it suffered from longitudinal instability in flight – not to mention a tendency to enter unrecoverable spins.

Efforts to correct these issues were made even as production went ahead, and the type was redesignated MiG-1 on December 9, 1940. These amendments included moving the engine 4in forward to improve stability, fitting a new water radiator, adding extra fuel and oil tanks, armouring the pilot's seat back, streamlining the engine's supercharger air intakes, strengthening the undercarriage, fitting a better propeller, providing more ammunition for the guns and installing a better gunsight.

With all of these changes in place, a new aircraft was born – the MiG-3. The first production example was finished on December 20, 1940, the type now being built in parallel with the unmodified MiG-1 rather than replacing it. State acceptance trials quickly indicated that curing some of the design's ills had also served to add weight, reducing manoeuvrability. At 509 miles, range was improved but still fell way below the government's specification of 620 miles. Top speed, however, was actually slightly higher than that of the MiG-1.

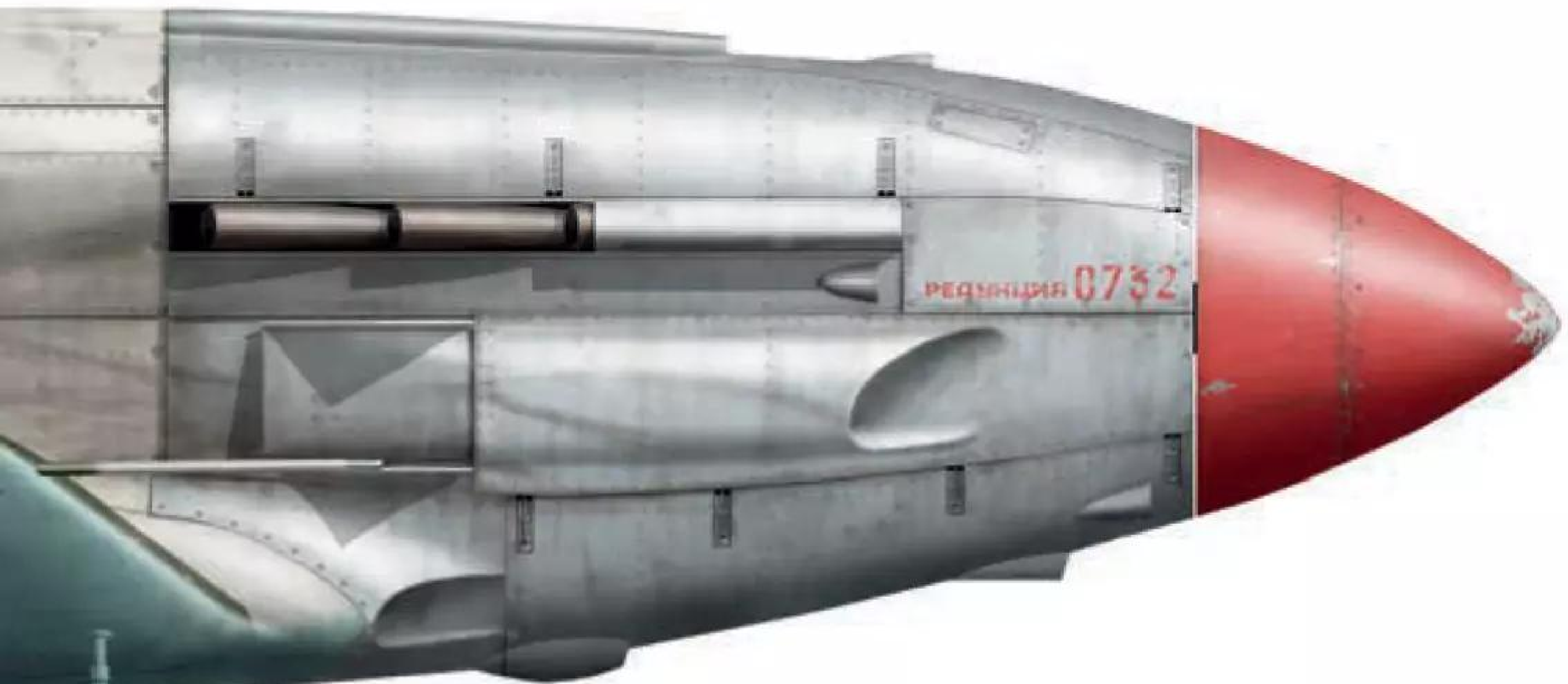
As the MiG-3 entered service with the Soviet Air Force during early 1941, numerous complaints about defects and poor quality workmanship arose. When the German invasion began, it became painfully obvious that three machine guns was inadequate when compared with the Bf 109's two machine guns and one 20mm cannon. An attempt to fix this involved installing an additional pair of .303 machine guns in underwing pods – but this caused a marked drop in performance, further reducing pilots' chances of success in combat.





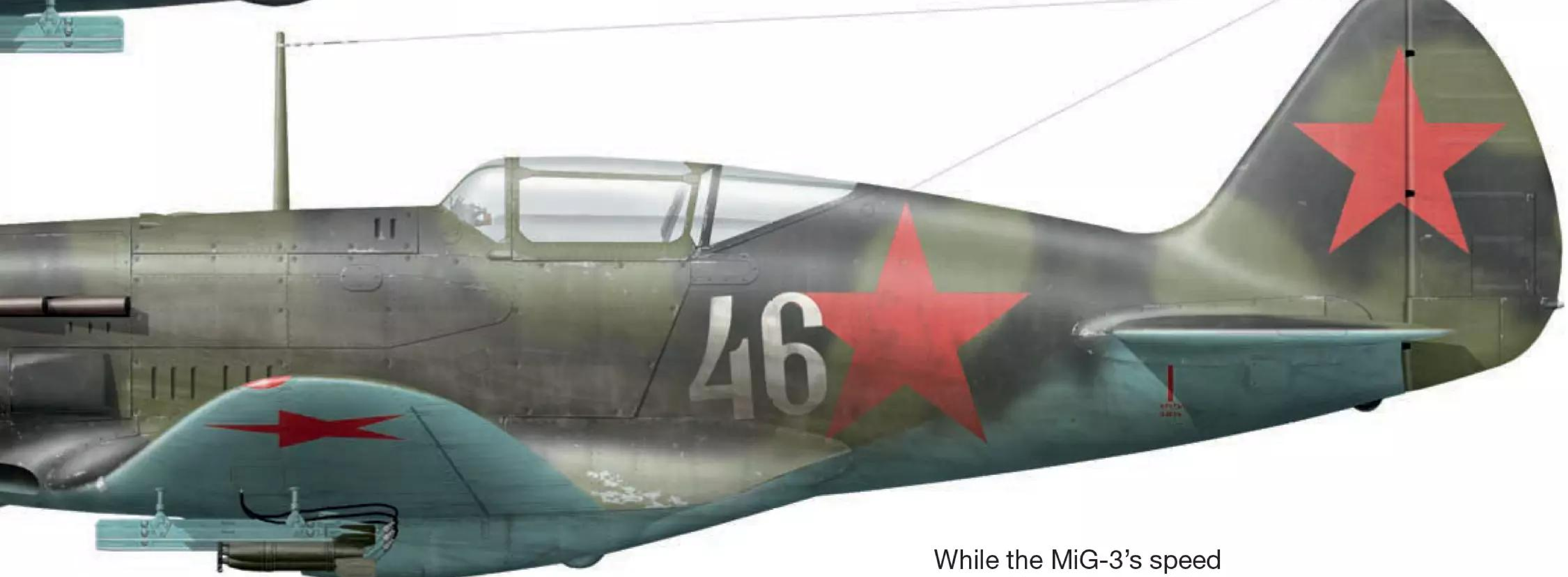
## MIKOYAN-GUREVICH MIG-3 (LATE SERIES)

**Pilots of the 12 GIAP/6 IAK flew this aircraft from Moscow PVO during March 1942. Note that the outer wing panels have been exchanged with green camouflaged wings without slots taken from an earlier MiG-3 version.**



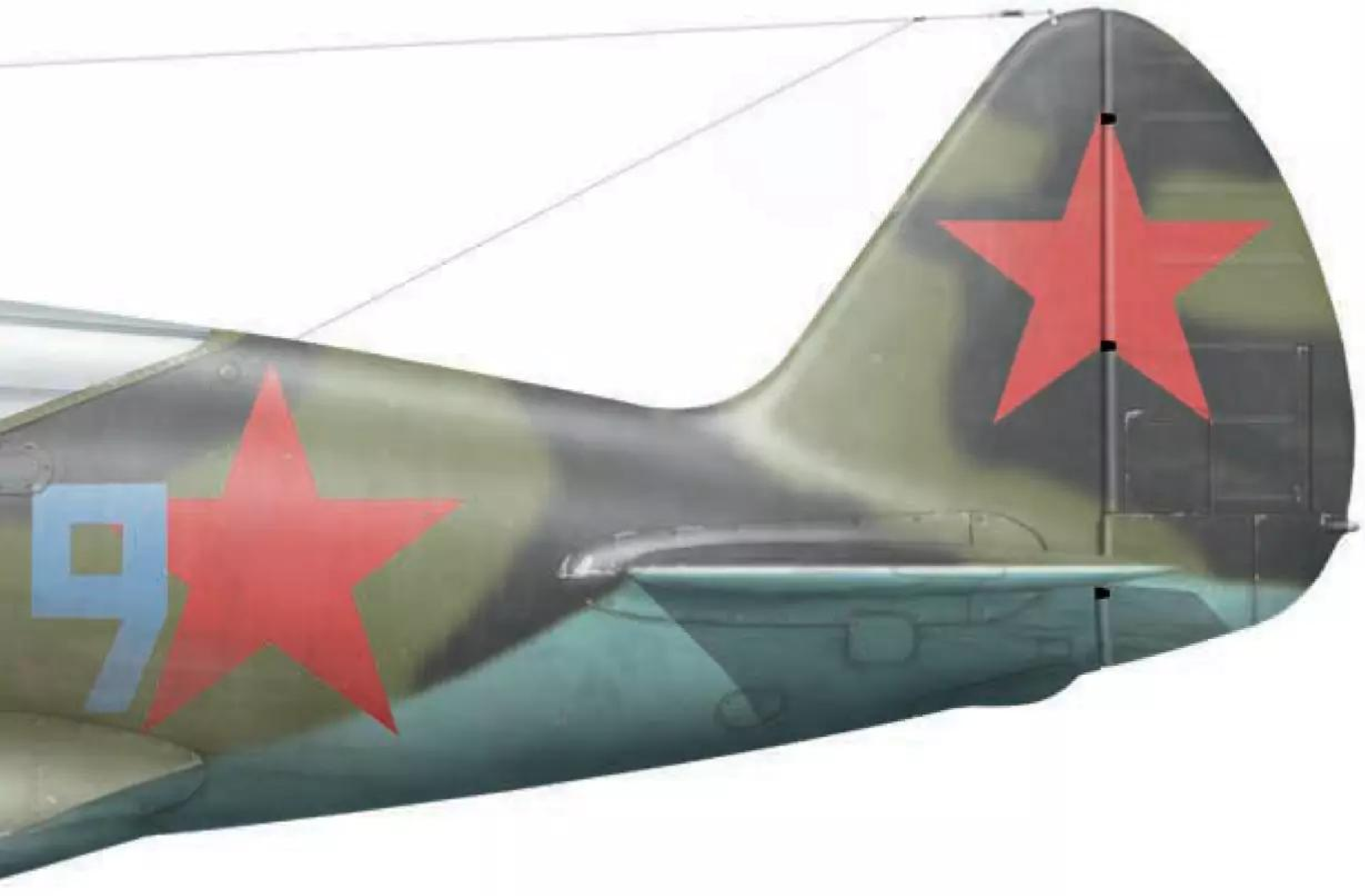
## MIKOYAN-GUREVICH MIG-3

**This MiG-3 was flown by members of 6 IAK from Moscow PVO during the spring of 1942.**



## MIKOYAN-GUREVICH MIG-3 (LATE SERIES)

**Painted in green/black camouflage, this MiG-3 belonged to the 162nd IAP, 43rd IAD, and was flown on the Leningrad front during the summer of 1942.**

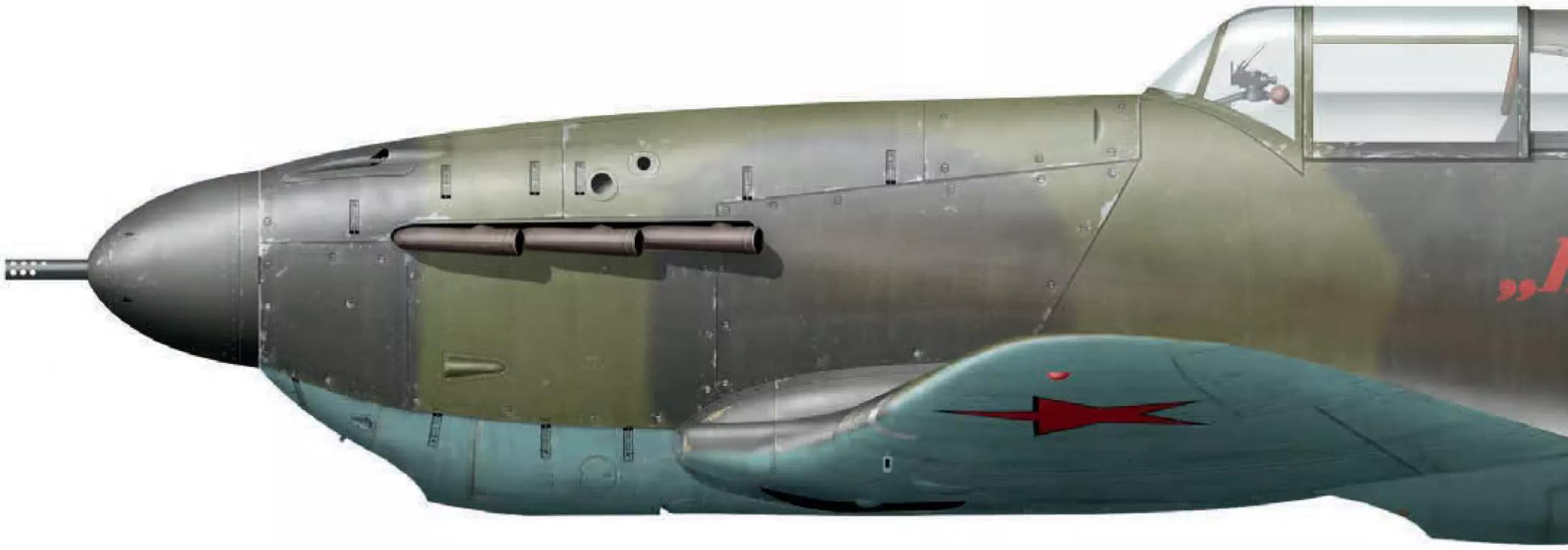


While the MiG-3's speed was roughly on a par with its contemporaries at high altitude, this parity disappeared at low level – where most aerial combat took place on the eastern front – and it proved inferior to German Bf 109 Fs. Its high wing loading reduced its manoeuvrability too, and combat experience highlighted a degree of instability around the horizontal plane which in practice meant that it had a tendency to 'wander' when its pilot was trying to line up a shot.

A total of 3172 MiG-3s were built, with production coming to a halt at the end of 1941. However, some continued in service until the end of the war. After this less-than-promising start, Mikoyan-Gurevich would not design another fighter that reached full production until the MiG-9 of 1946. •

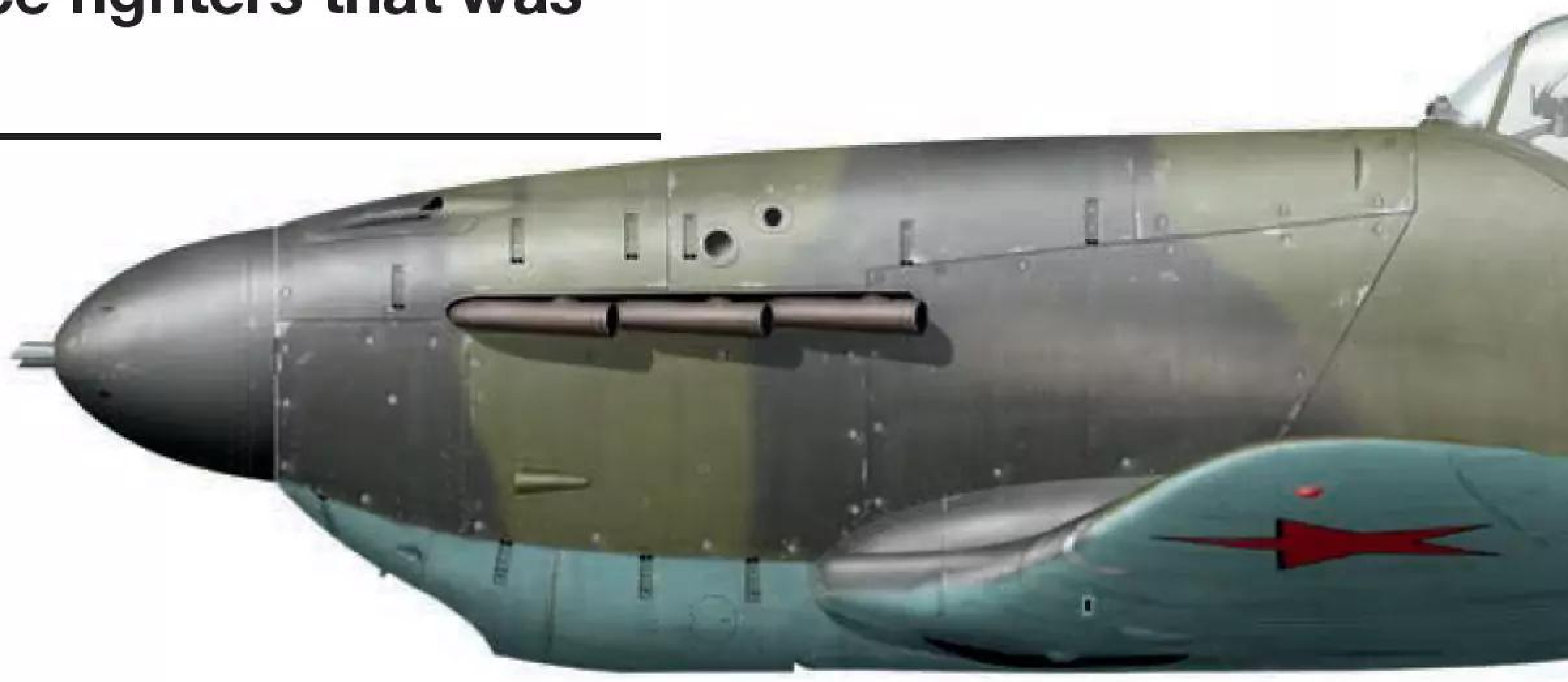
THE MIG-3 WAS HEAVY AND HARD TO FLY

# LAVOCHKIN-GORB LAGG-3



**The single-seat LaGG-3 showed early promise but was let down by technical problems. It did, however, lay the foundations for a successful family of high-performance fighters that was to follow.**

1940-1945



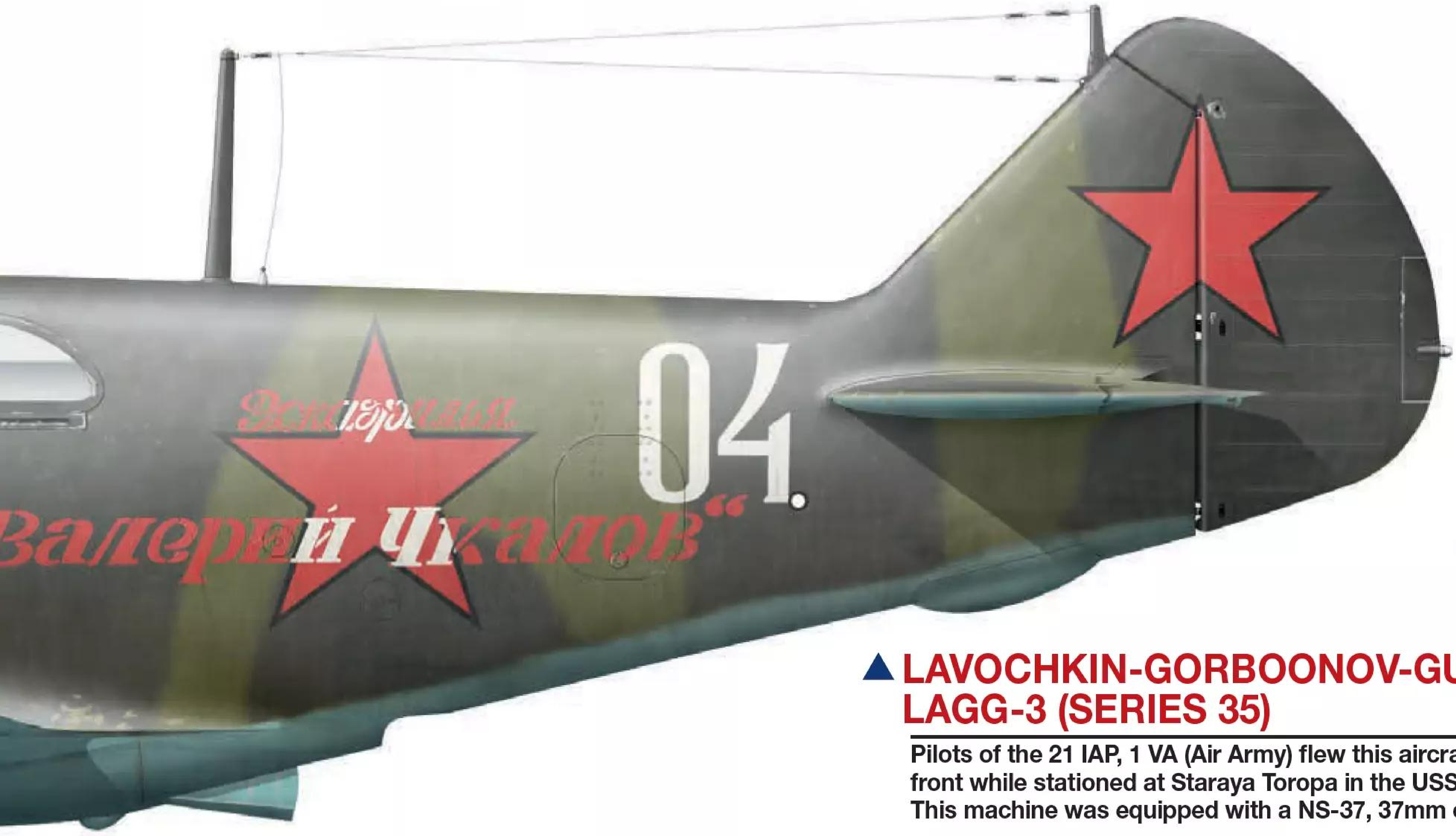
The head of the People's Commissariat of Aircraft Industry's technical department, Vladimir Petrovich Gorboonov, decided in early 1939 that what the Soviet Union really needed was a fighter made largely out of wood.

After having the idea for this aircraft, he directed engineer Semyon Lavochkin, who had studied under Andrei Tupolev, to actually design it. He was soon joined by another People's Commissariat of Aircraft Industry engineer Mikhail Ivanovich Gudkov and together Gorboonov, Lavochkin and Gudkov presented their project to the actual People's Commissar of Aircraft Industry, who gave them leave to set up their own design bureau together in May 1939.

The wooden design, dubbed 'Project K', was then submitted for the government's next generation fighter competition alongside the designs that would lead to the Yak-3 and MiG-3. In late June, the government ordered two prototypes and the Lavochkin-Gorboonov-Gudkov bureau was swiftly relocated to a former furniture factory, Plant No. 301, which had originally been repurposed to licence-build French-designed aircraft.

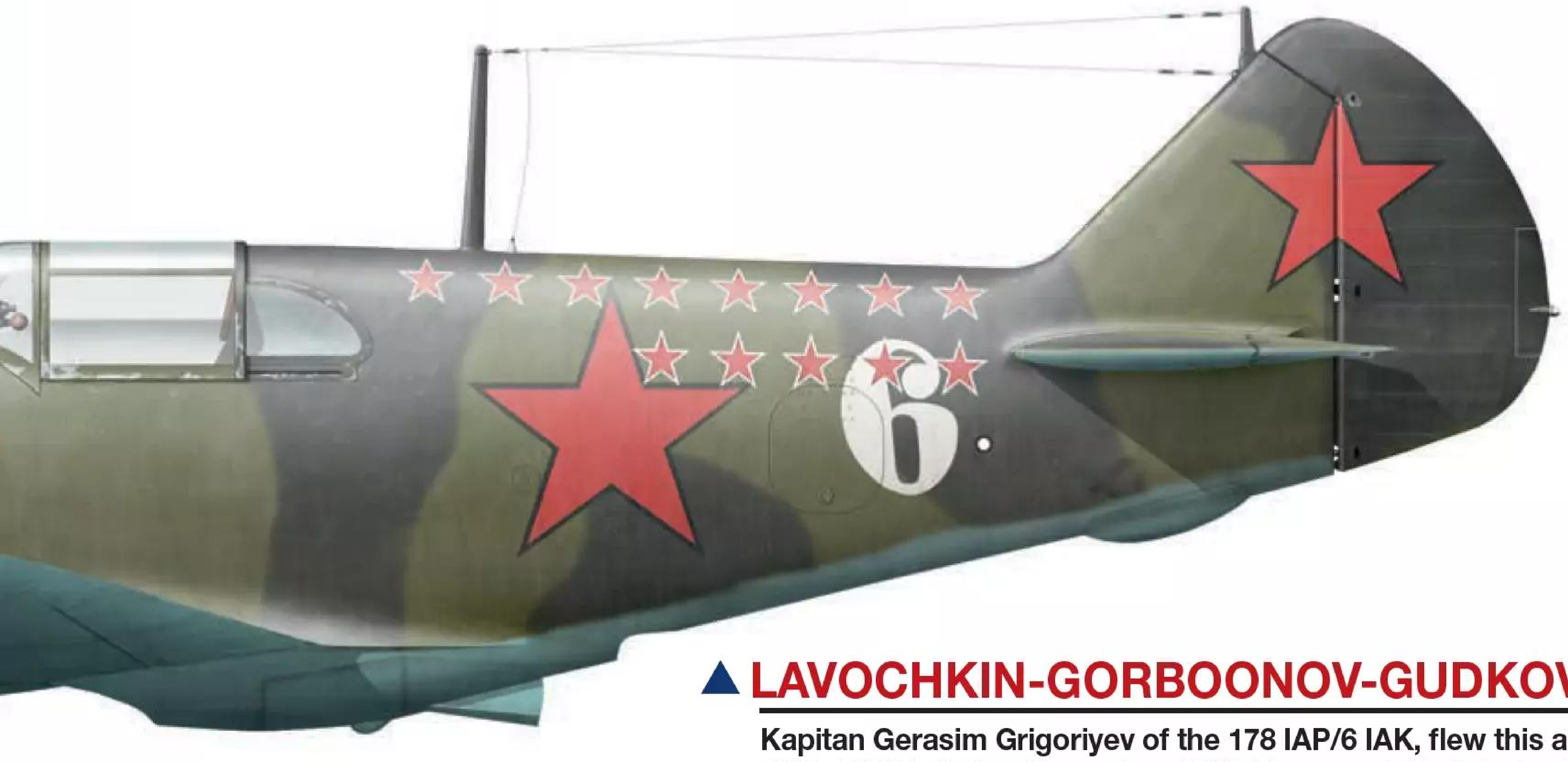
After a mock-up had been approved, work on the first Project K prototype began in January 1940. It was redesignated I-301 in reference to the factory's number. Unfortunately, the factory only had 93 inexperienced staff and the three bureau leaders

# OONOV-GUDKOV



**▲ LAVOCHKIN-GORBOONOV-GUDKOV LAGG-3 (SERIES 35)**

**Pilots of the 21 IAP, 1 VA (Air Army) flew this aircraft on the Kalininsky front while stationed at Staraya Toropa in the USSR during May 1943. This machine was equipped with a NS-37, 37mm cannon.**



**▲ LAVOCHKIN-GORBOONOV-GUDKOV LAGG-3 (SERIES 35)**

**Kapitan Gerasim Grigoriyev of the 178 IAP/6 IAK, flew this aircraft while stationed at Moscow PVO, USSR, during December 1942. He scored 11 victories in air combat plus two shared.**

quarrelled with one another so the People's Commissariat of Aircraft Industry decided to give overall leadership to Lavochkin, the I-301's original designer.

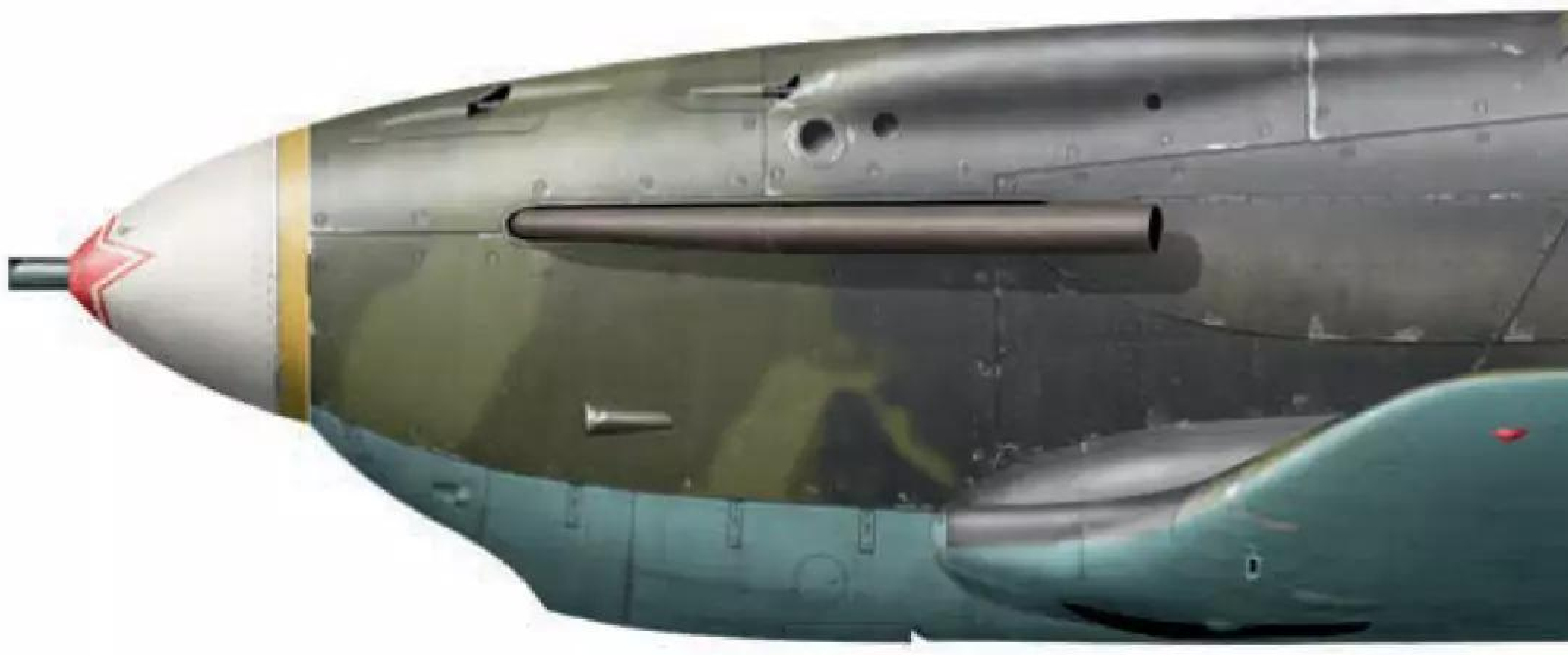
Within three months, the prototype was ready – although the workers had discovered in the meantime that the chemicals needed to bond its wooden structure caused severe irritation when they came into contact with human skin.

The monoplane fighter was powered by a Klimov M-105 liquid-cooled V12 engine and the fuselage was made primarily of birch. It was armed with a single .90 calibre MP-6 cannon firing through the propeller hub plus a pair of .50 calibre heavy machine guns.

The aircraft's first flight was on March 30, 1940, and its performance was rated as satisfactory. After two months of in-house testing, state acceptance trials began on June 14. These revealed an all-up weight of 6543lb and a top speed of 363mph at 15,420ft. Modifications to the carburettor air scoop and

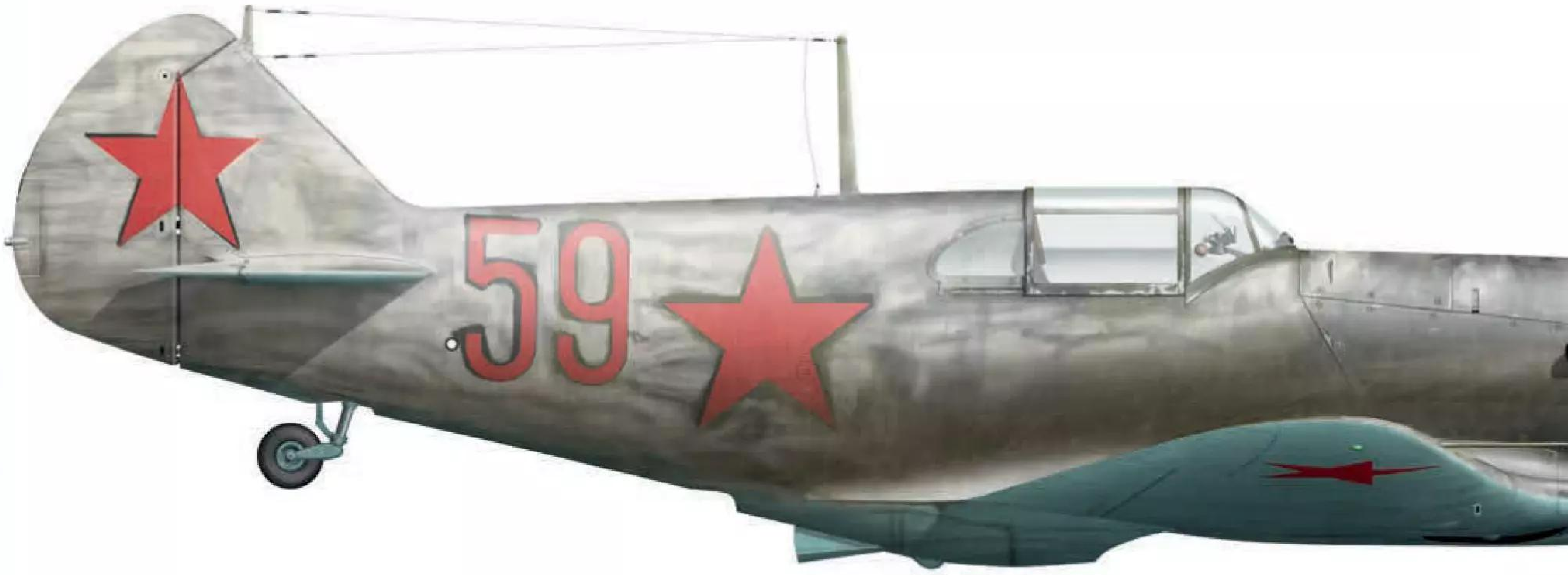
## LAVOCHKIN-GORBOONOV-GUDKOV LAGG-3 (SERIES 2/3) ▼

**One of the LaGG-3's few supporters was Mayor Leonid Galchenko, commander of the 609 IAP. This was his aircraft while stationed at Afrikanda Airdrome in the USSR during late 1942. He had started out flying the I-16 until converting towards the end of 1941. Once the supply of LaGG-3s had been exhausted he switched to the La-5F but even when the La-5FN and La-7 became available he stuck with the La-5F, fighting on the Karelian front and in the arctic. Overall, he achieved 24 victories in air combat plus 12 shared.**



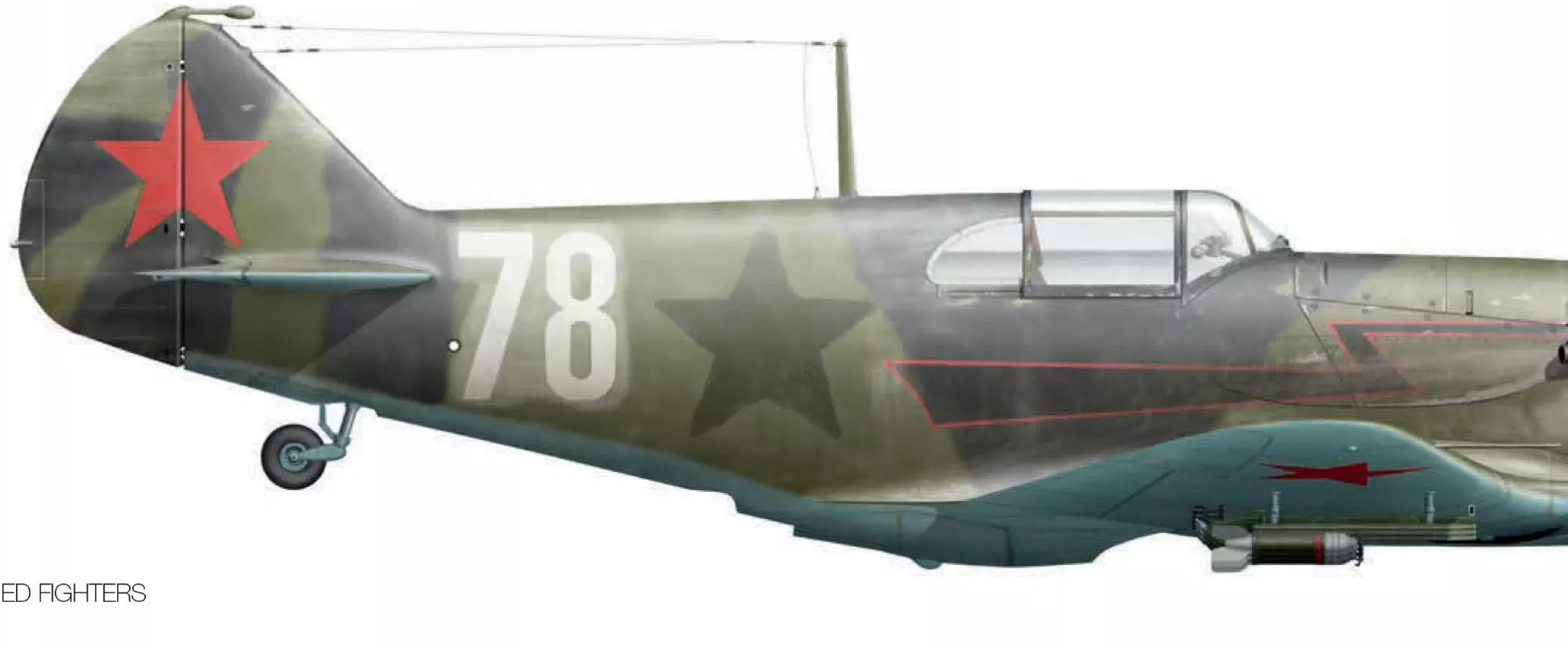
## LAVOCHKIN-GORBOONOV-GUDKOV LAGG-3 (SERIES 29) ▼

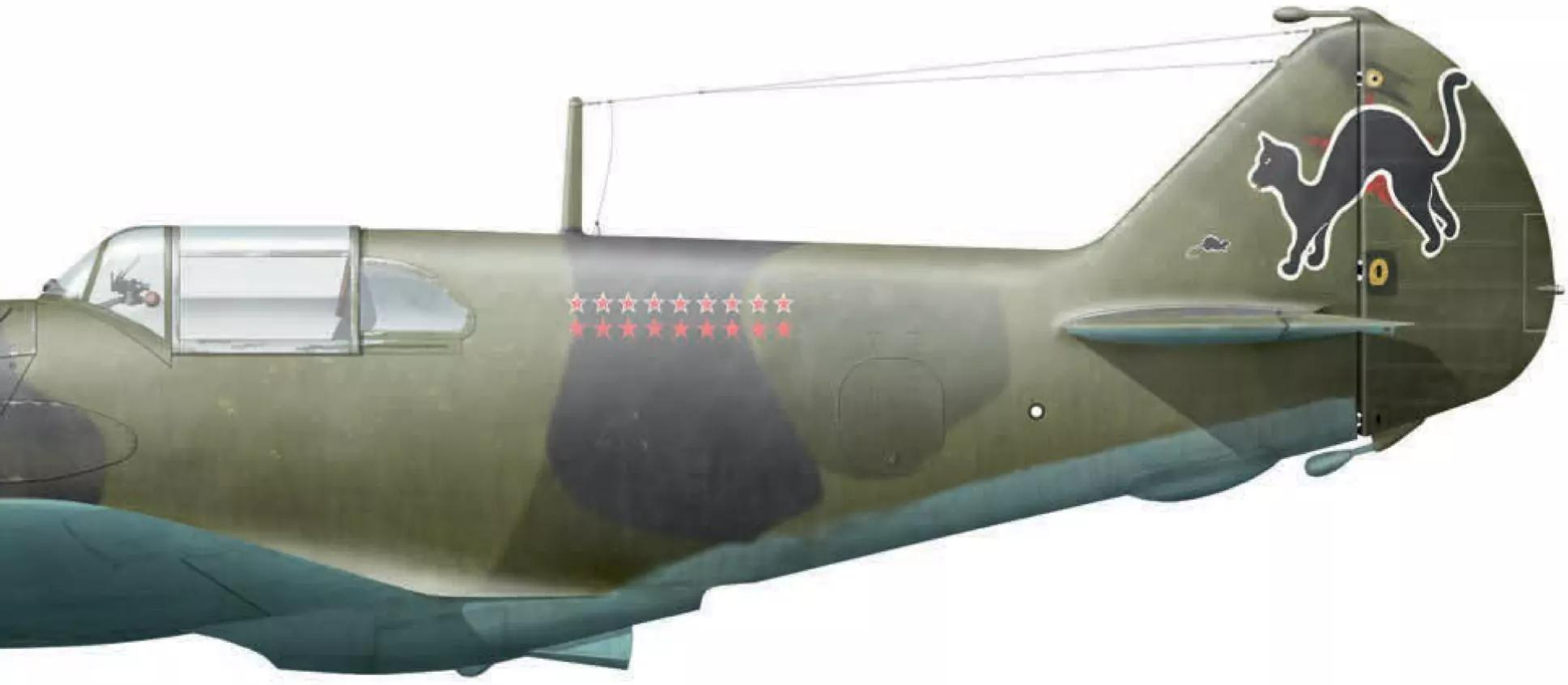
**Naval flying ace Kapitan Igor Aleksandrovich Kaberov, of the 3 GIAP/KBF, flew this aircraft while stationed at Lake Ladoga near Leningrad during the winter of 1942/43. He began the war flying I-16s with the air force of the Soviet Baltic Fleet – shooting down a Bf 109 on August 4, 1941, before ramming a Junkers Ju 88 later that month. He began flying LaGG-3s towards the end of the year. Before being withdrawn from front line combat during the summer of 1943, he achieved eight victories in air combat plus 18 shared.**



## LAVOCHKIN-GORBOONOV-GUDKOV LAGG-3 (SERIES 11) ▼

**Featuring a distinctive black lightning bolt with red edging, this aircraft was flown by Kapitan Victor Petrovich Mironov, commander of the 609th IAP during the summer of 1942. Mironov achieved 15 victories in air combat and was later made a Hero of the Soviet Union.**





with the radiator air flaps fully closed the type was able to achieve 375mph.

Besides this promising performance, as with the other new Soviet fighters then in development, a whole host of defects were also identified – including the cabin overheating badly and weakness in the undercarriage. Range was also insufficient and this resulted in a design change whereby additional fuel tanks would be fitted within the wings of the production version.

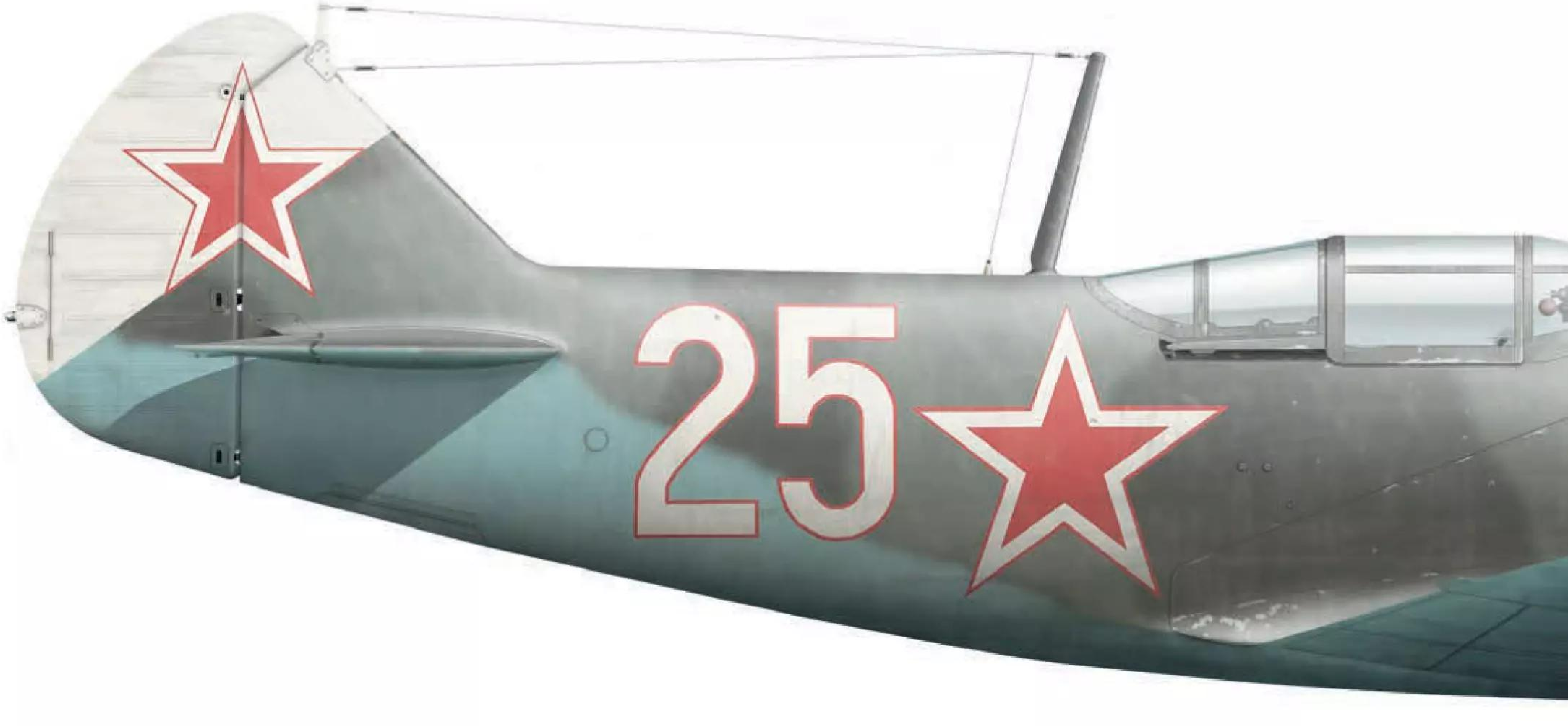
When series construction was approved, the I-301 prototype without the extra tanks was designated LaGG-1, while the full production version became the LaGG-3. The first of these was flown for the first time in December 1940. With so little time for proper testing, many of the defects previously identified had gone uncorrected and front line units issued with the new type soon began to complain about engines overheating, hydraulics failing and radiators leaking.

There were problems with the LaGG-3's weaponry too. The mighty MP-6 cannon worked but its recoil was shattering, so in the earliest production model aircraft it was replaced with a third .50 cal machine gun. By February 1941, an incredible 2228 design changes had been made on the fly as LaGG-3s continued to roll off production lines. Even then, the type's weak undercarriage remained a problem.

As late as July 1941, a month after the beginning of the German invasion, not a single unit equipped with the LaGG-3 was in a state of combat readiness due to the persistence of seemingly uncurable defects. To make matters worse, the poor build quality of the production models also hampered their performance. Far from doing 375mph, they could only manage 341mph on average. Climb rate and range also suffered.

Gradually, these problems were tackled and combat operations commenced in August 1941. However, like the earliest MiGs and Yaks, the LaGG-3 proved to be generally inferior to the Luftwaffe's Messerschmitt Bf 109s. Its cooling system was extremely vulnerable and it lacked the acceleration to properly defend itself, let alone protect ground-attack aircraft such as the Il-2. It had a good rate of turn but this alone was not enough to save it. In some situations, LaGG-3 units had to be protected by other units flying Yaks.

Devastating losses were incurred and the Soviet High Command ruled in August 1942 that the LaGG-3 was not to be operated in areas where Luftwaffe activity was high. Production continued into 1943 before the last plant building the LaGG-3 was switched to production of the Yak-3. Overall 6528 LaGG-3s were built. •



# LAVOCHKIN LA-5

1942-1946

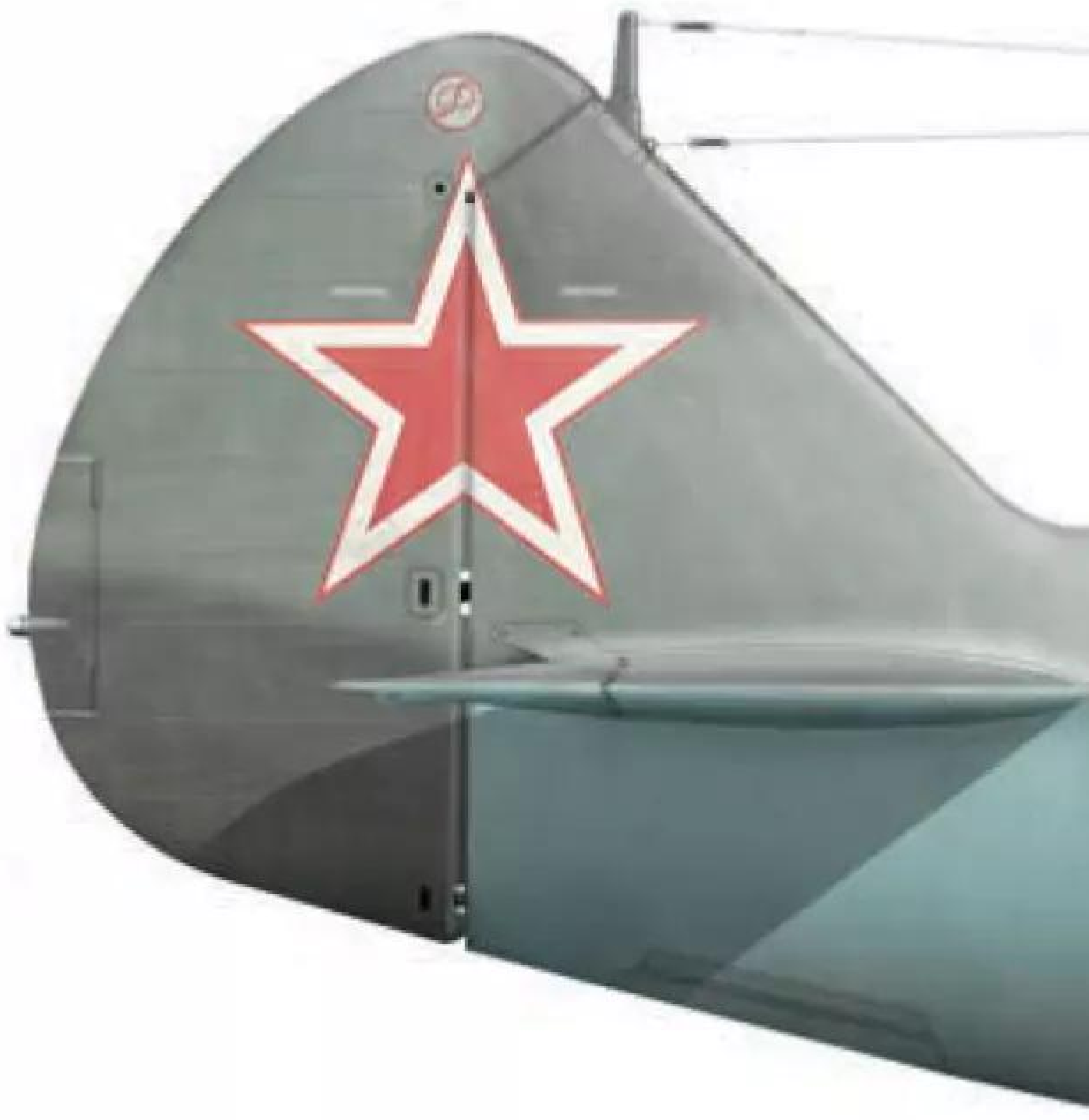
**Efforts to overcome the LaGG-3's manifold flaws along with the installation of a more powerful new engine resulted in a heavily modified version of the original that could hold its own against even the best of the Luftwaffe's mid-war fighters – the La-5FN.**

With the LaGG-3 plagued by defects and suffering badly against the Luftwaffe's Bf 109s in front line combat, Lavochkin needed to come up with a replacement fast.

Part of the LaGG-3's problem was its weight. Apart from all the other concerns, it was badly in need of more power and there was no obvious way of providing it. Elsewhere, and at the same time, engine maker Shvetsov was struggling with its M-82 air-cooled two-row 14-cylinder unit.

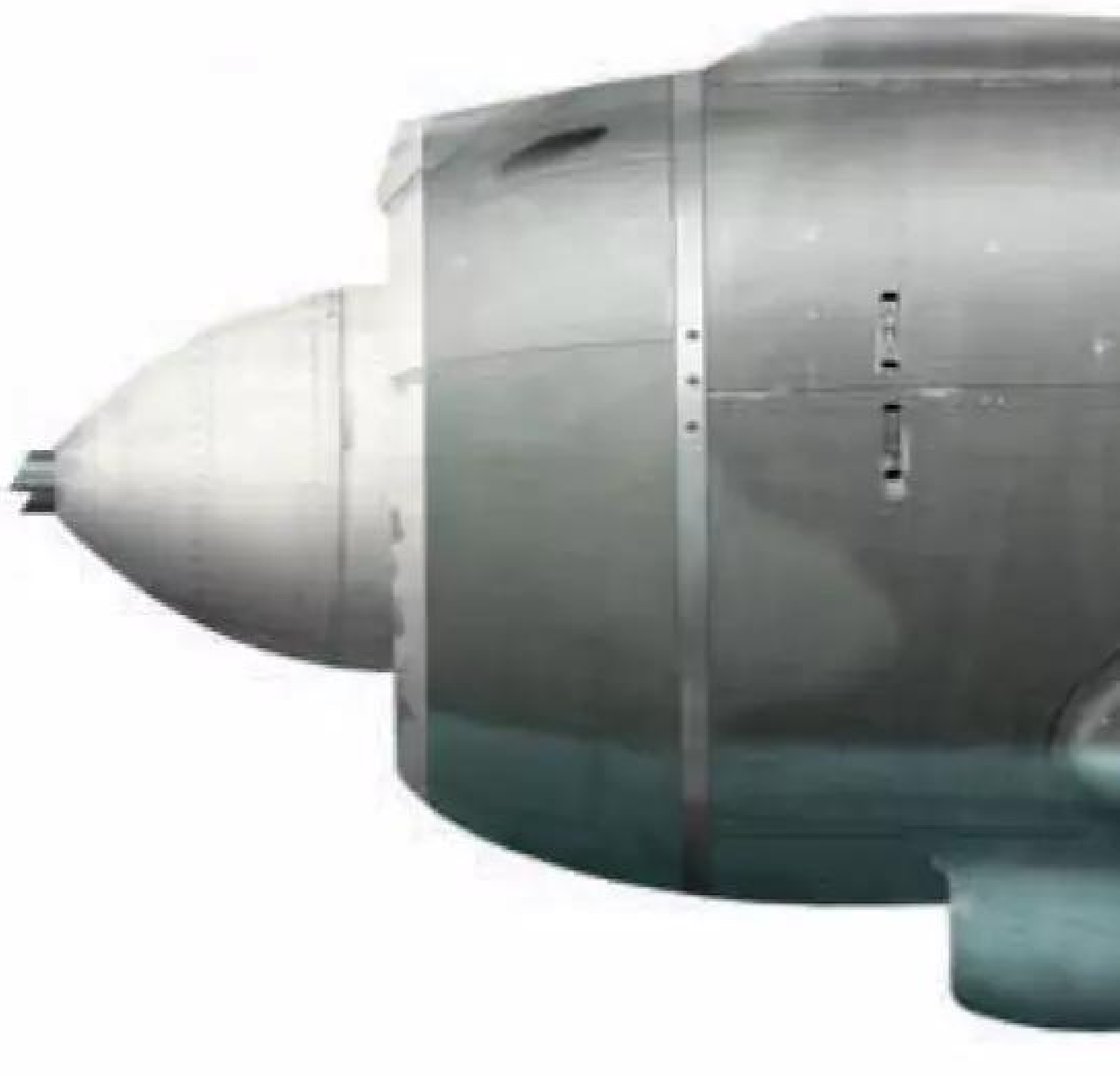
The M-82 was a development of the M-62 nine-cylinder engine, which was itself a development of the M-25 – the licence-built copy of the Wright Cyclone which had powered the earlier Polikarpov I-16s. By mid-1941 both Mikoyan/Gurevich and Yakovlev had built prototype versions of their main line fighters around the M-82 but neither had been sufficiently impressed to put it into production.

Only Sukhoi had made use of it, on some later examples of its Su-2 bomber, but that type's limited production run meant Shvetsov's new engines were ending up stockpiled in a warehouse. With cancellation of LaGG-



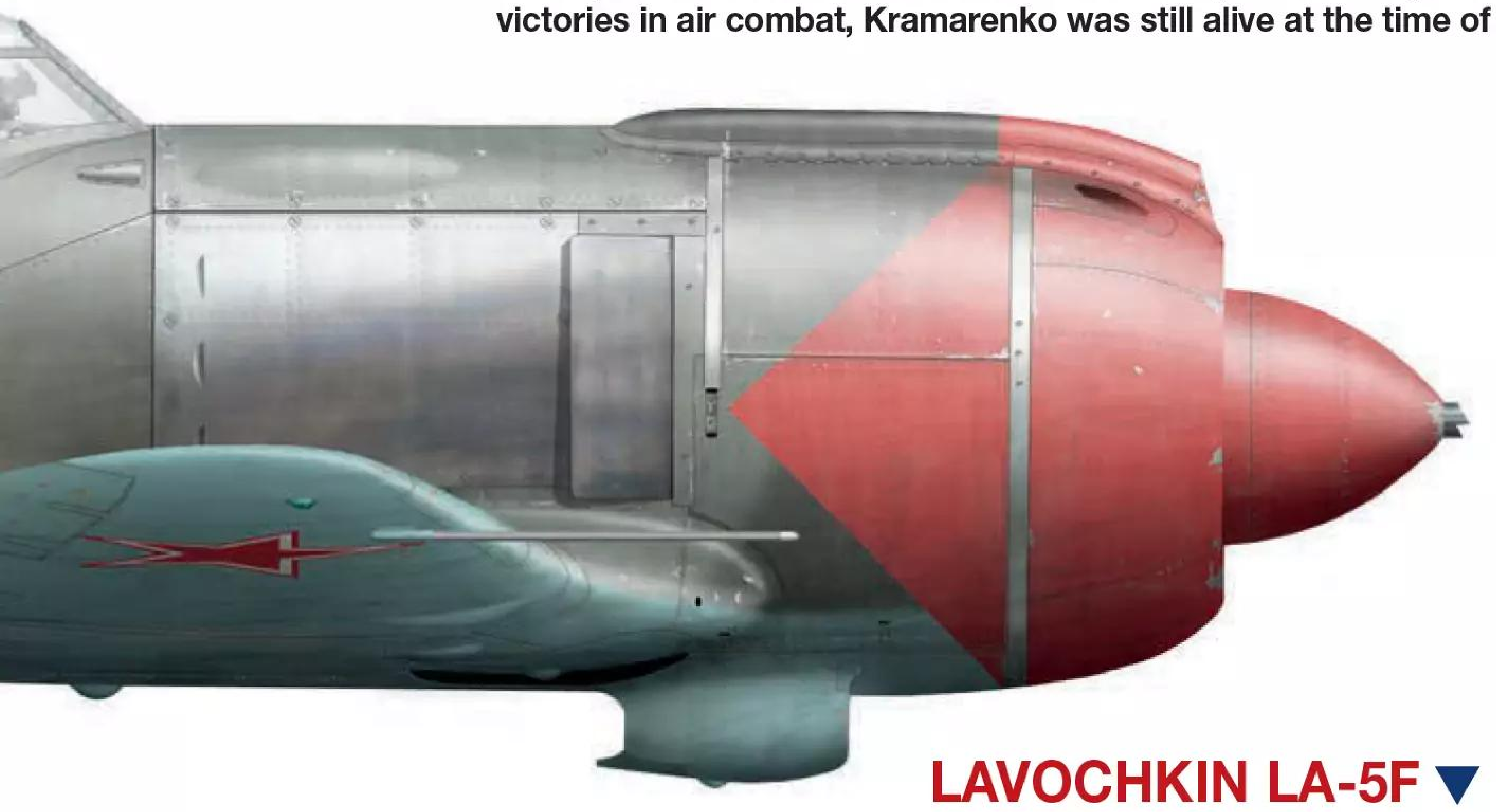
**LAVOCHKIN LA-5F ▼**

**This aircraft was flown by pilots of the 5 GIAP on the 1st Ukrainian front during the spring of 1943.**



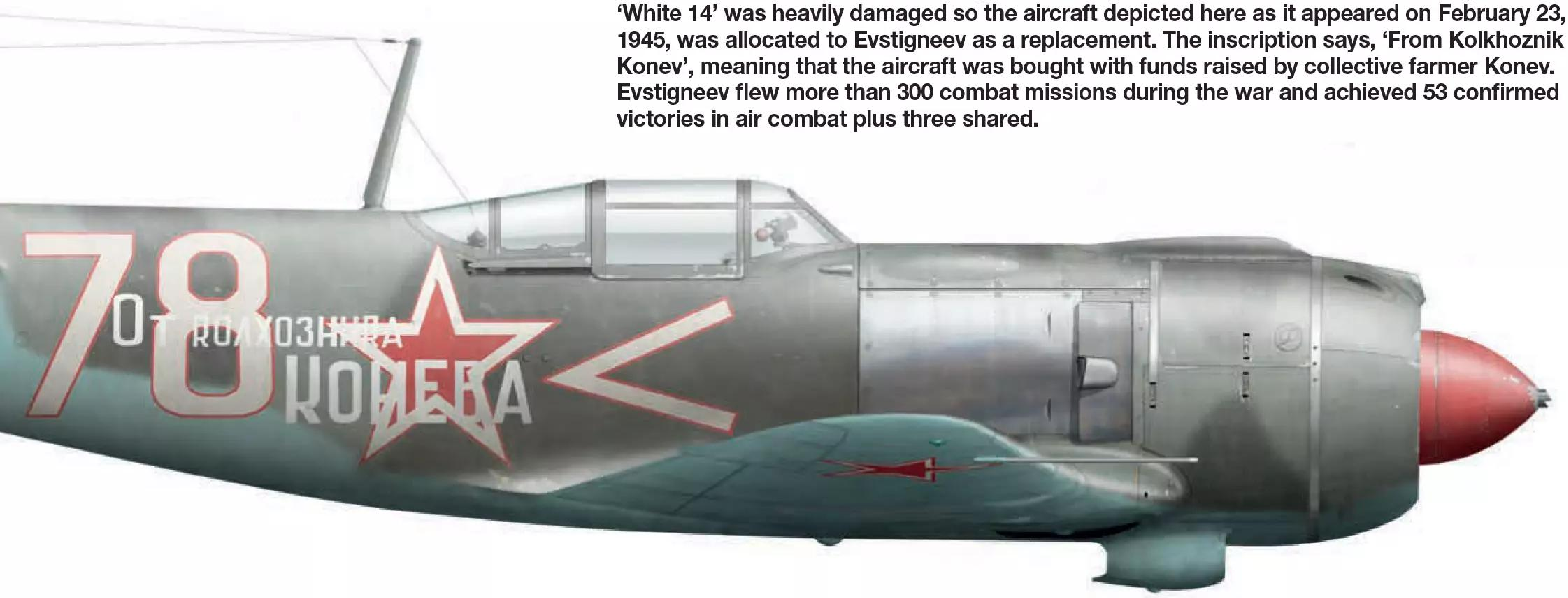
## LAVOCHKIN LA-5FN ▼

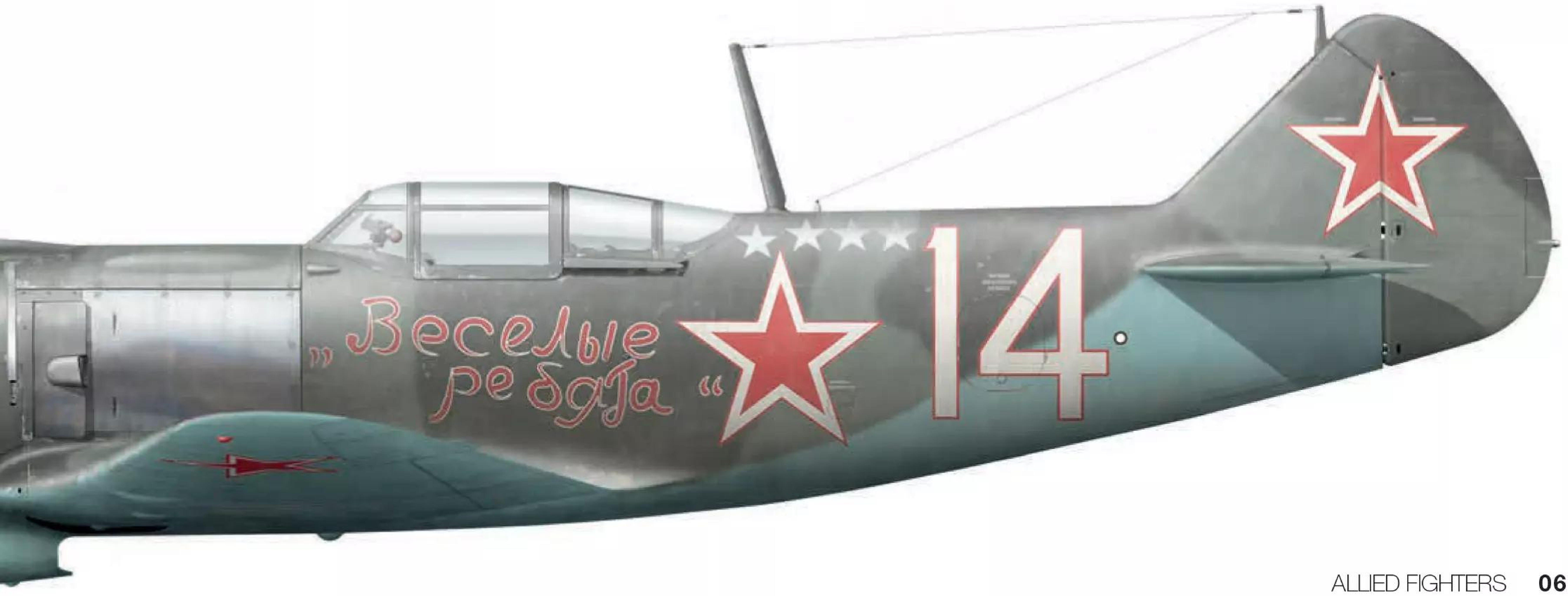
**A trio of La-5FNs, one of them flown by Leytenant Sergei Makarovich Kramarenko of the 19th IAP, intercepted a group of Ju 88s escorted by six Bf 110s on March 19, 1944. The leader of the trio, Pavel Maslyakov, shot down one of the 88s but was then attacked by one of the Messerschmitts. Kramarenko in turn attacked the Messerschmitt but was then hit by his wingman. With his La-5FN burning, Kramarenko bailed out. He survived but suffered severe burns to his face and hands. Captured by the Germans, he was about to be executed by the SS when a German general ordered that be taken to hospital instead – where he was liberated by Soviet troops two weeks later. Having ended the war with two confirmed victories in air combat, Kramarenko was still alive at the time of writing, aged 93.**



## LAVOCHKIN LA-5F ▼

**Kapitan Kirill Alekseevich Evstigneev of the 178th GvIAP scored five victories with a machine coded ‘White 14’ – the last involving a head-on attack against a Fw 190 on February 17, 1945. ‘White 14’ was heavily damaged so the aircraft depicted here as it appeared on February 23, 1945, was allocated to Evstigneev as a replacement. The inscription says, ‘From Kolkhoznik Konev’, meaning that the aircraft was bought with funds raised by collective farmer Konev. Evstigneev flew more than 300 combat missions during the war and achieved 53 confirmed victories in air combat plus three shared.**





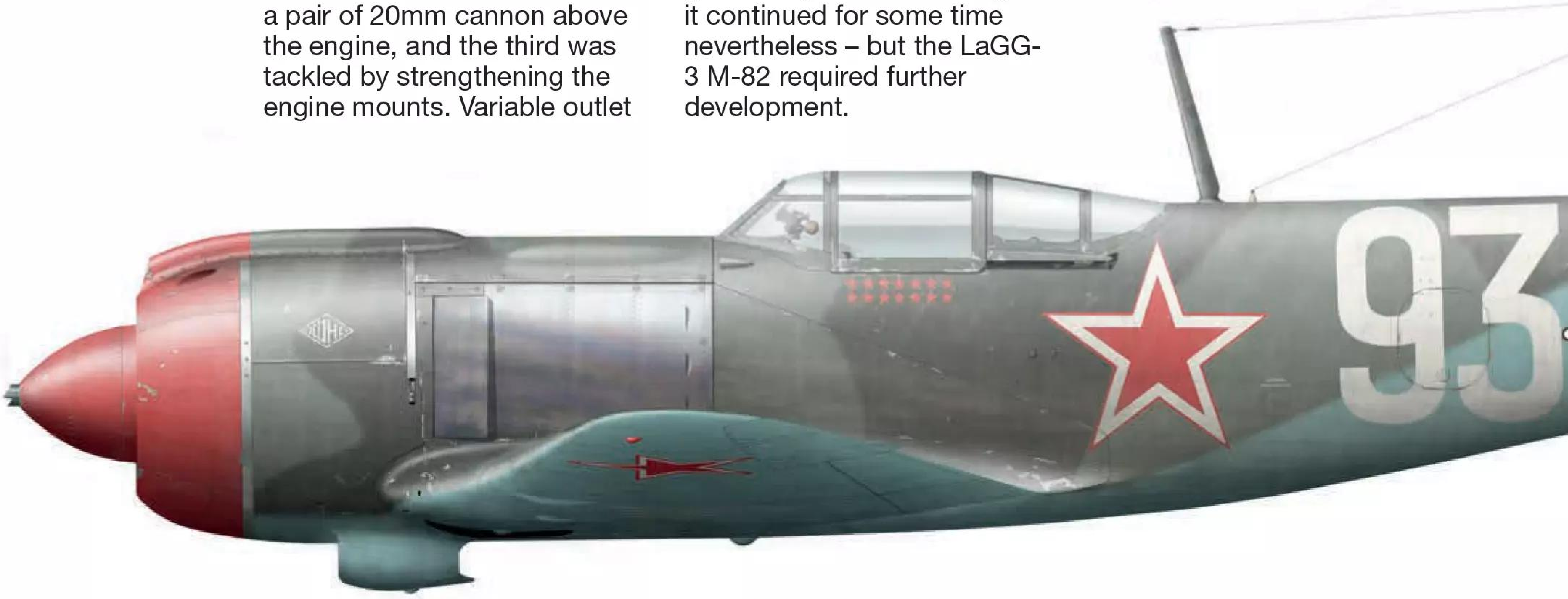
3 production imminent, Lavochkin made contact with Shvetsov and the two parties resolved to work together to overcome their respective problems – by creating a new version of the LaGG-3 which used the Shvetsov powerplant.

Three serious problems stood in their way however. The M-82 was 18in wider in diameter than the LaGG-3's fuselage, it was unable to accommodate any engine-mounted weaponry and it was also substantially heavier than the fighter's original engine, the M-105P, causing the aircraft's centre of gravity to shift.

The first problem was solved by fitting a new fairing or skirt around the existing fuselage which joined it to the rear of the engine, the second meant the fitment of a pair of 20mm cannon above the engine, and the third was tackled by strengthening the engine mounts. Variable outlet flaps on the fuselage sides provided the engine with its air-cooling.

A rough-built flying prototype, known as the Gu-82, was ready by September 1941 and proved to be so impressive that series production was approved before any tests had even been undertaken. The first LaGG-3 M-82 was completed in February 1942 and when tests were finally carried out it was determined to be a full 10% faster than a production LaGG-3 with M-105P.

The aircraft was not burdened by field equipment such as a radio mast or bomb racks but this still represented a substantial improvement. The order to cancel production of the original LaGG-3 was given in April 1942 – though it continued for some time nevertheless – but the LaGG-3 M-82 required further development.

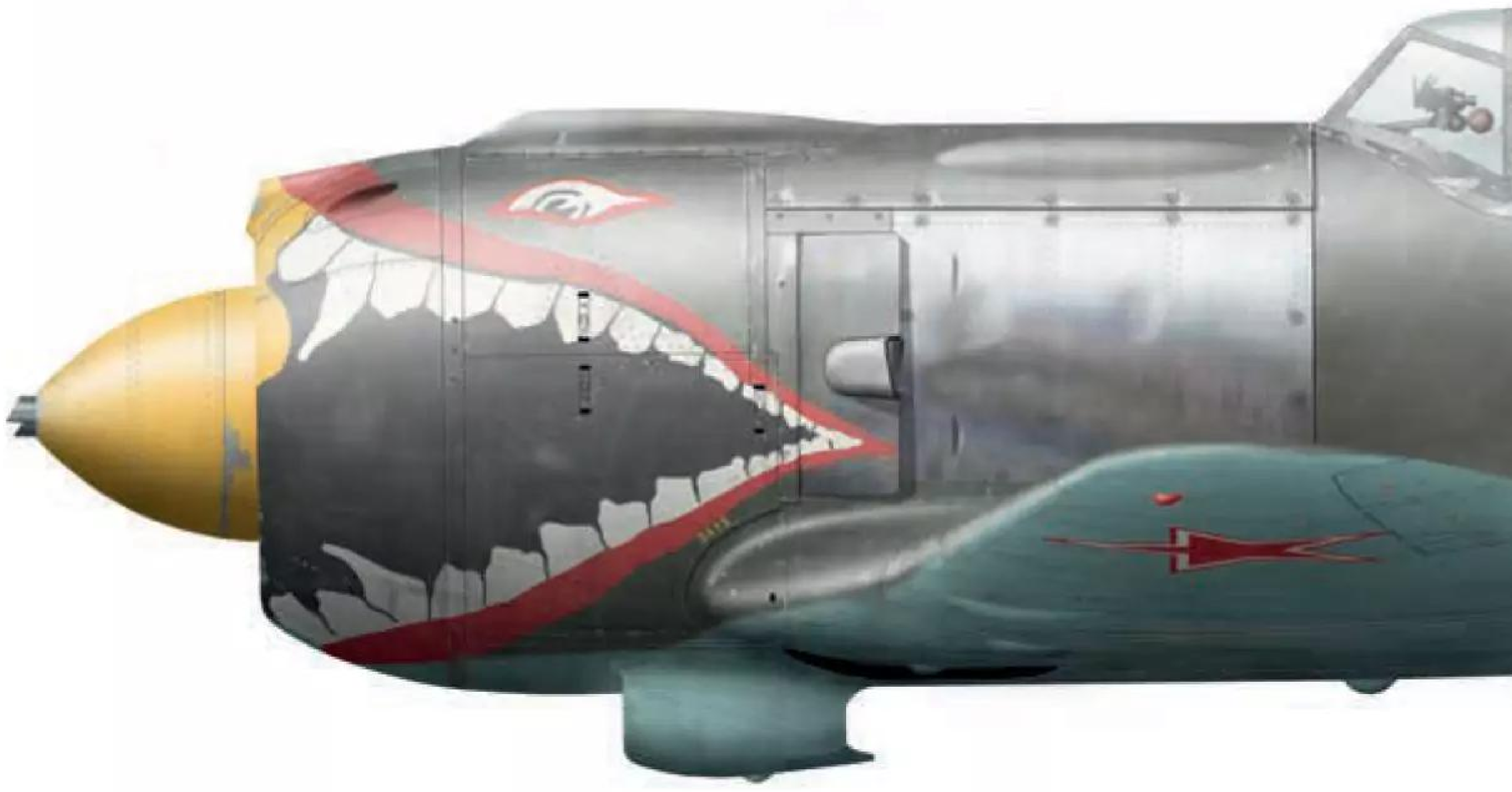


## ▲ LAVOCHKIN LA-5FN

**One of the La-5's more vocal supporters was Starshiy Leytenant Vladimir Aleksandrovich Orekhov, who fought on the Kursk Front during July 1943. He flew 420 combat sorties and achieved 19 victories in air combat plus two shared. He is also credited with four aircraft destroyed on the ground plus two balloons.**

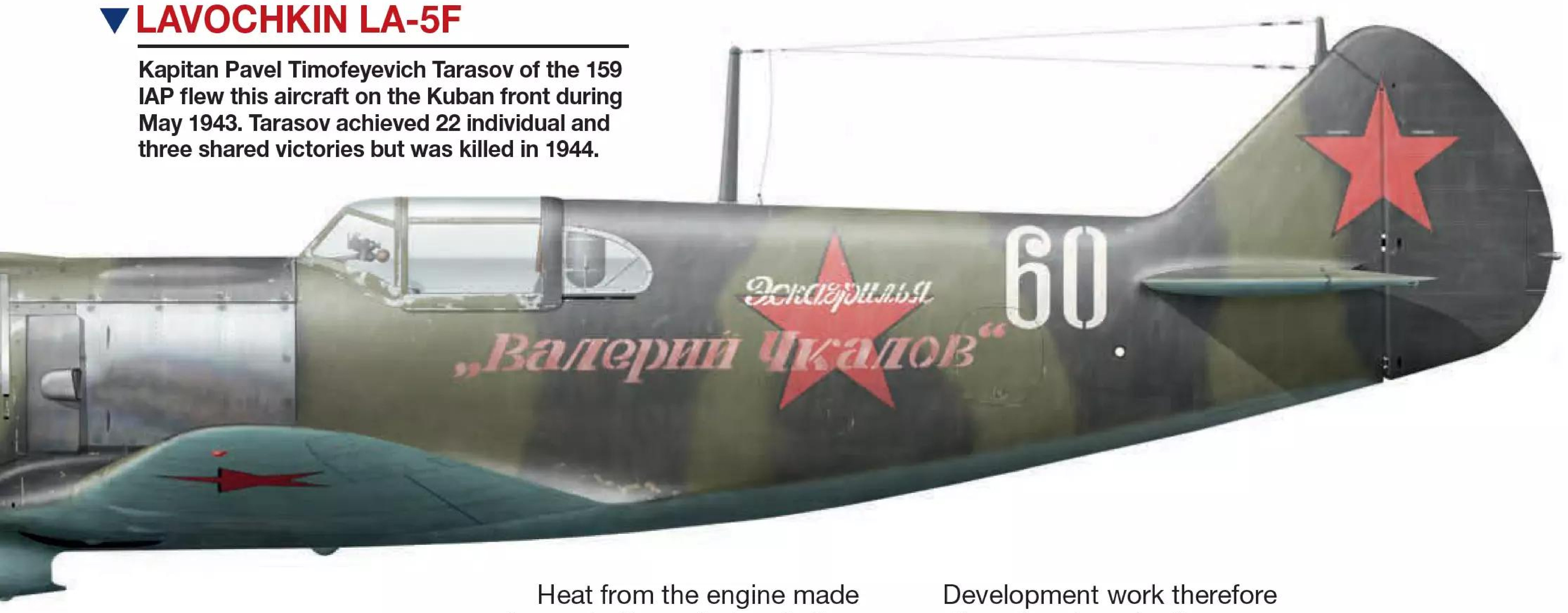
## LAVOCHKIN LA-5 ▶

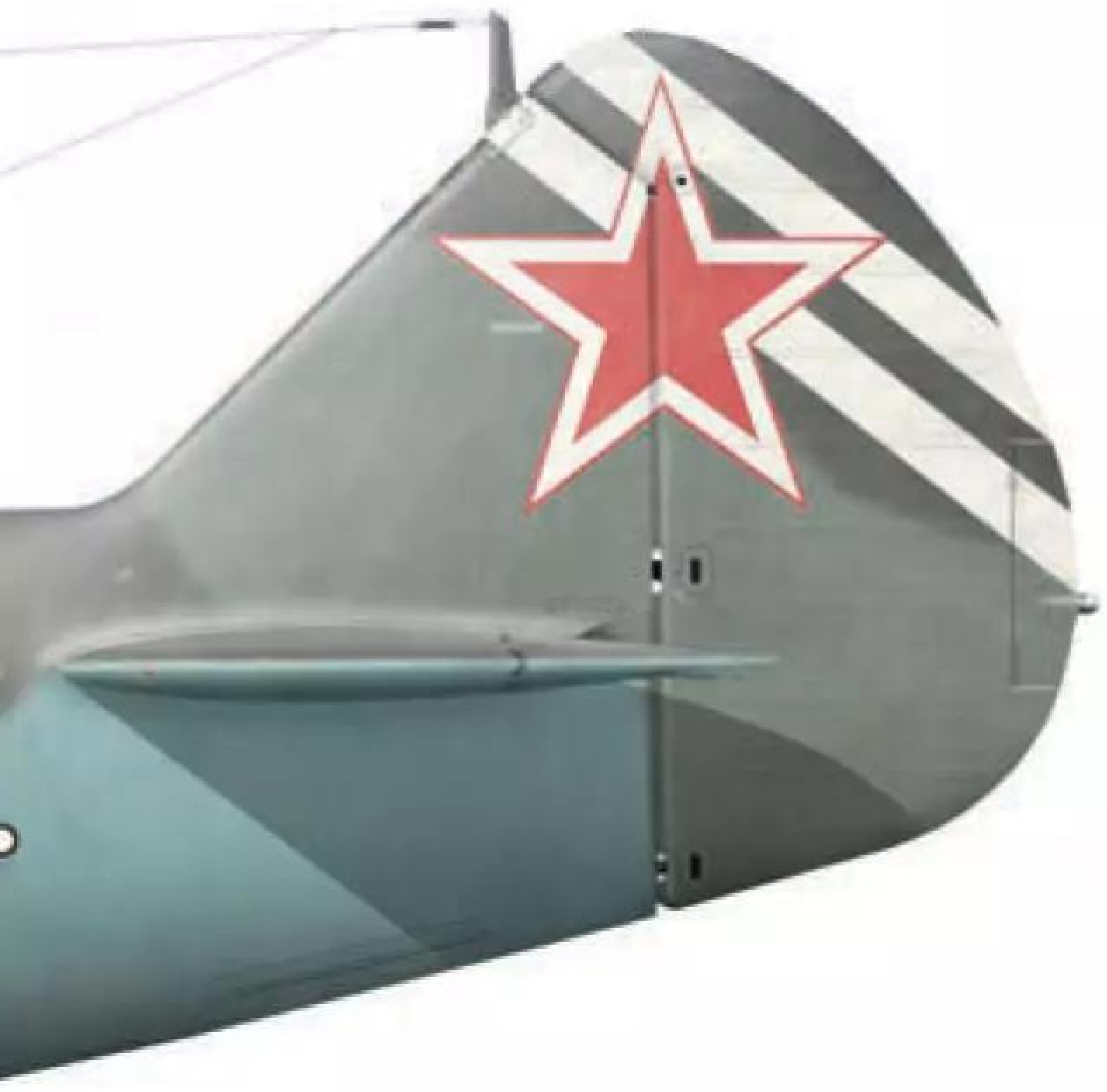
**Controversial ace Kapitan Georgiy D. Kostylev of the 4 GIAP/KBF flew this aircraft on the Leningrad front during October 1943 – and was very lucky to have been able to do so. During the winter of 1941 he was invited to a banquet but when he saw all the splendid food and drink laid out in front of him he became furious, smashing his glass and shoving a major from the supply train who tried to stop him. In a matter of days he was demoted to private, stripped of awards he had earned up to that point including Hero of the Soviet Union, expelled from the Community Party and ordered to serve in a penal battalion. When his sentence was up, his unit refused to have him back. However, an old friend got him into a unit flying the La-5 and by August 1943 he was deemed to have been 'rehabilitated'. During 418 combat missions he scored at least 22 victories in air combat plus 34 shared.**



## LAVOCHKIN LA-5F

**Kapitan Pavel Timofeyevich Tarasov of the 159 IAP flew this aircraft on the Kuban front during May 1943. Tarasov achieved 22 individual and three shared victories but was killed in 1944.**





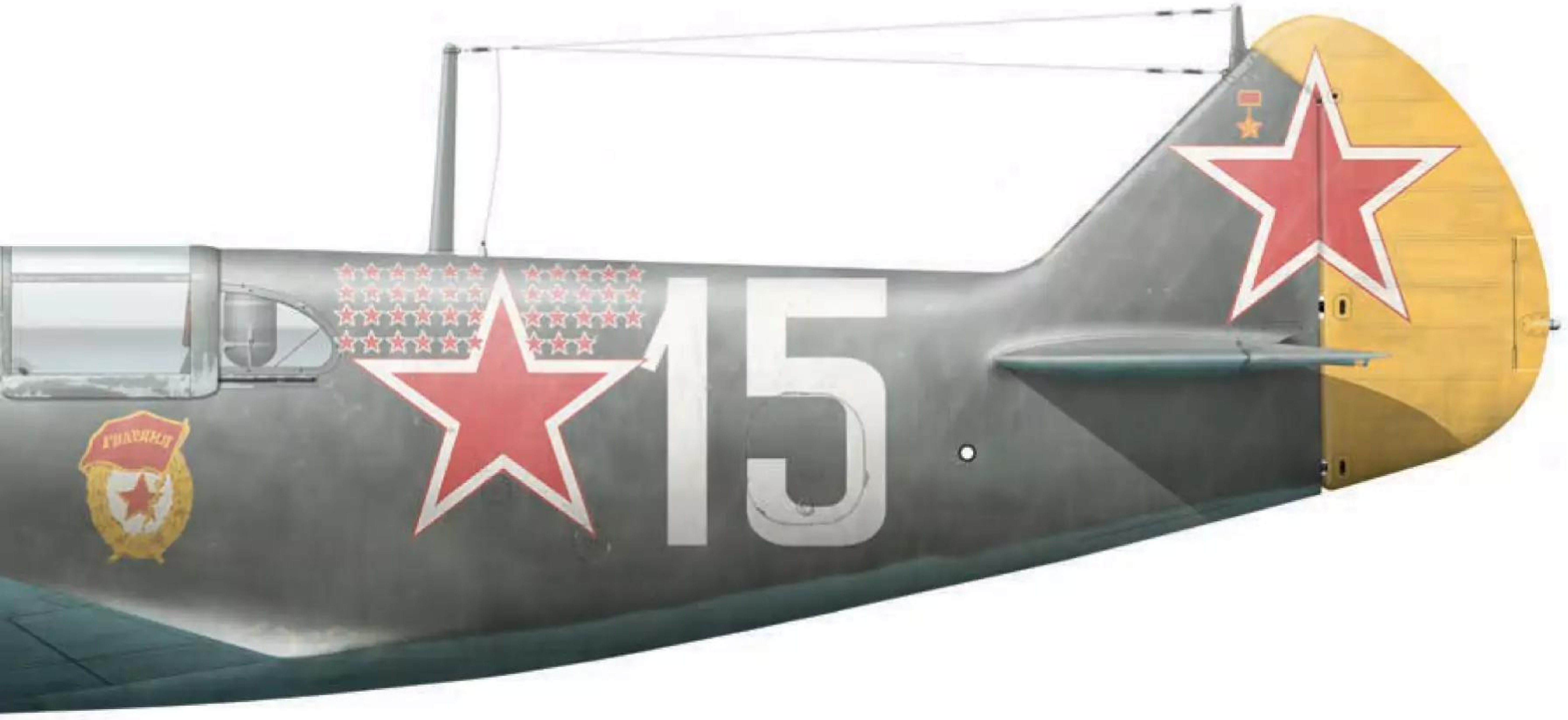
Heat from the engine made the cockpit very hot and oil temperature rose quickly to unacceptable levels. It was also harder for a pilot to handle than its predecessor and required considerable physical strength to exert sufficient stick force for more extreme manoeuvring.

Production model LaGG-3 M-82s began to reach squadrons in June 1942 and the type was redesignated La-5 in September 1942. New problems had cropped up in the meantime – poorly fitted engine cowlings added drag and reduced performance, oil pumps struggled, sparkplugs failed after between five and 10 hours' operation, exhaust pipes overheated and burned through, cockpit visibility was limited and the fighter was too heavy.

Development work therefore continued and production line modifications were made even as the defect-laden models were being delivered to Soviet Air Force units. Cockpit visibility was improved in November 1942 with a fuselage modification which saw the section immediately behind the canopy cut away and replaced with a new bulletproof glass panel.

Further changes included sealing the joints on the engine cowling to prevent drag-inducing airflow, reshaping of the duct for the oil cooler, increasing the cross-section of the exhaust pipes and strengthening the doors for the retractable tailwheel. The design of the trim tabs was altered several times, the control column was revised

HUGE EFFORTS WERE MADE TO CURE THE LA-5'S FLAWS



and the area of the control surfaces was reduced to offer a better balance of handling and manoeuvrability.

In January 1943, La-5s were fitted with the new M-82F engine, which had been altered to cure the oil pump and sparkplug problems – increasing engine life from 100 hours to over 150. With the cockpit and engine modifications, the La-5 became the La-5F. During the spring of 1943, another new engine was introduced, the M-82NV. This replaced the carburettors of the M-82 and M-82F with direct fuel injection into the cylinder heads and gave a very respectable top speed of 384.6mph at 18,400ft.

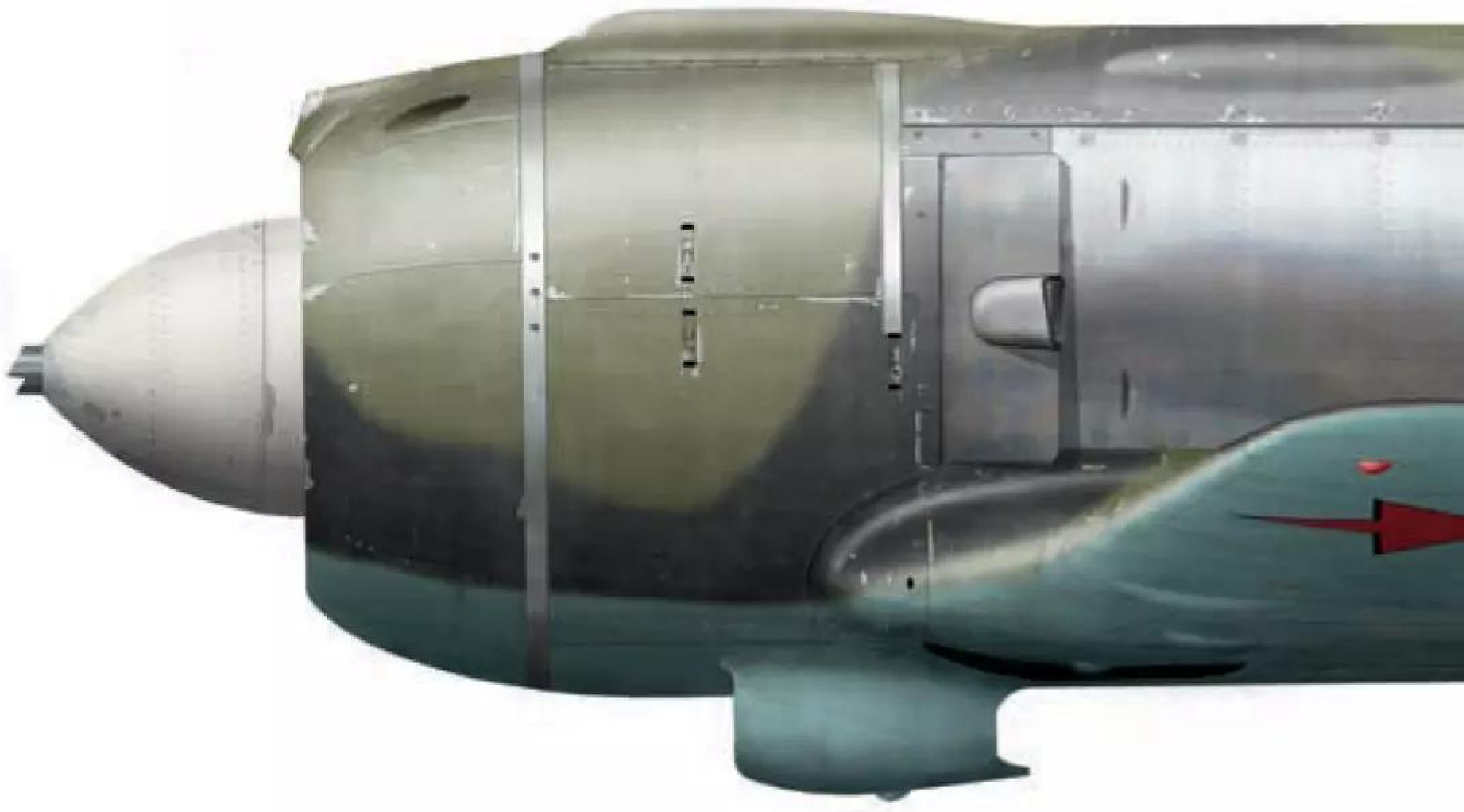
With the engine redesignated ASh-82FN, the aircraft became the La-5FN and designers next attempted to address its weight problem. The centre section of the wings, the cockpit hood, the engine's attachments and the undercarriage were all assessed and replaced with lighter components. In addition, weight was saved by replacing the original five small fuel tanks with three larger ones, the structure of the wing spars was altered to further shave off weight and surface finish was improved to create a more aerodynamic shape.

Even with all these alterations made, however, pilots continued to complain about the cockpit being overly hot and inadequately sealed against the ingress of engine fumes. Consequently, they often flew with the canopy open –

THE LA-5FN WAS AS GOOD AS THE LATEST BF 109S AND FW 190S

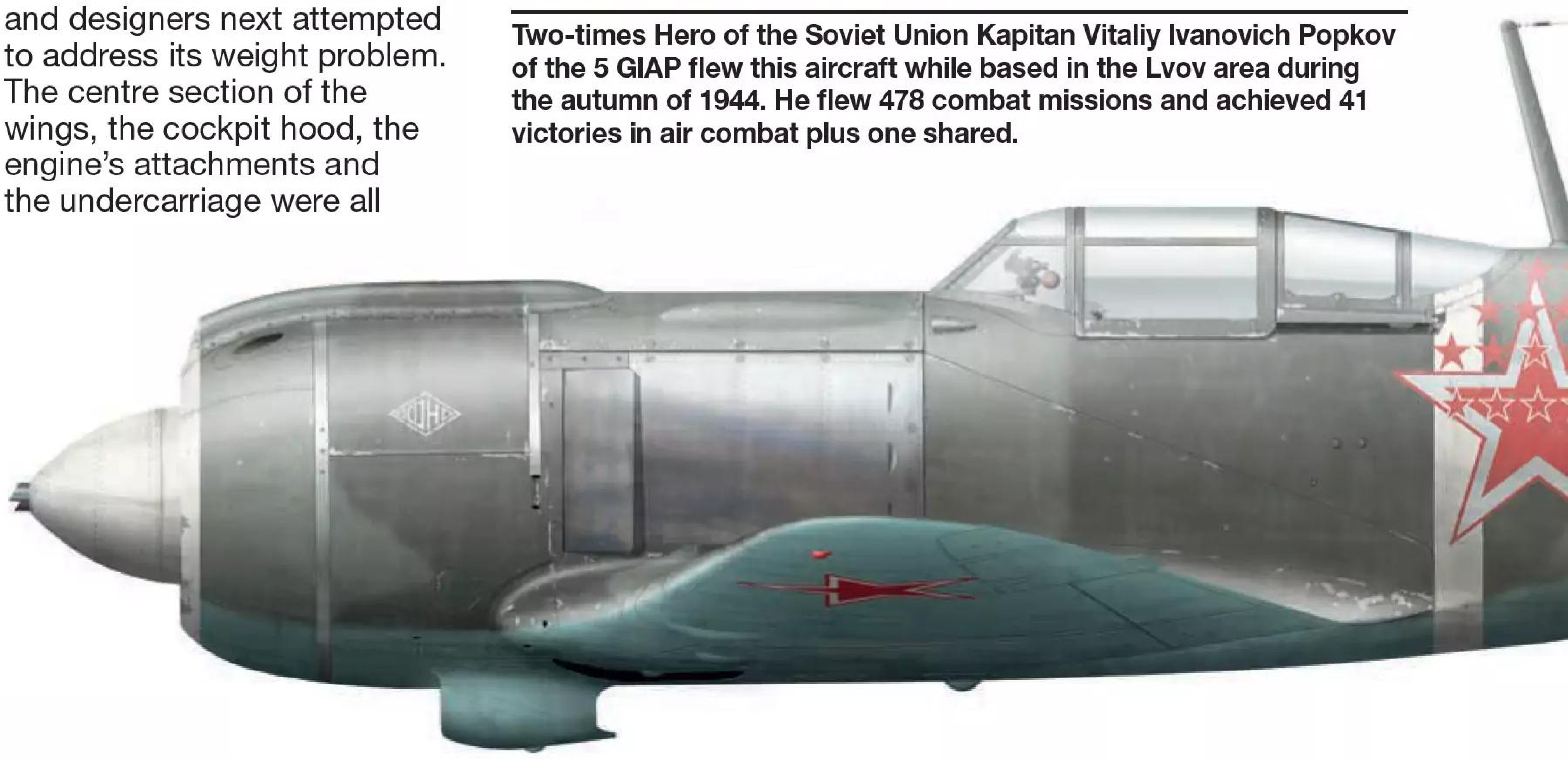
## LAVOCHKIN LA-5F ▼

**This aircraft was flown by pilots of the 3 GIAP, based at Lavansaari in the USSR during June 1944.**



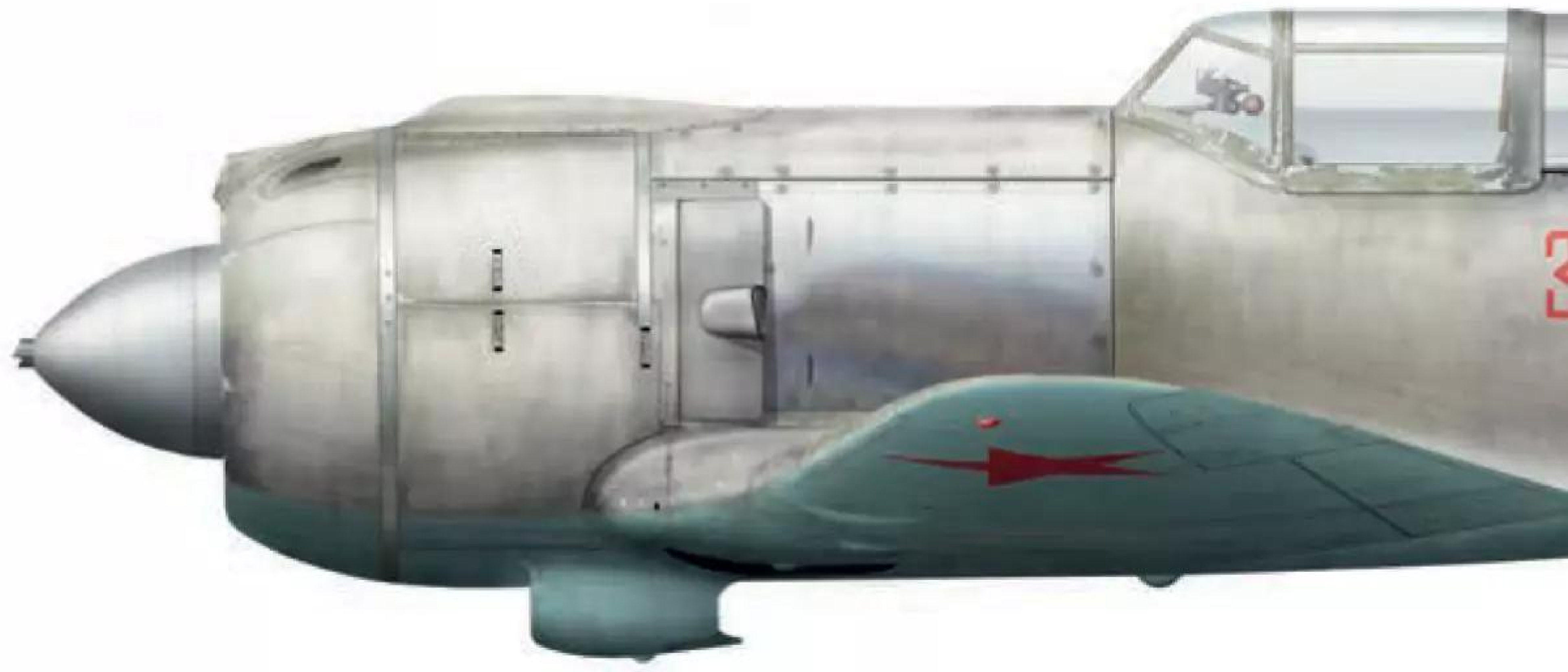
## LAVOCHKIN LA-5FN ▼

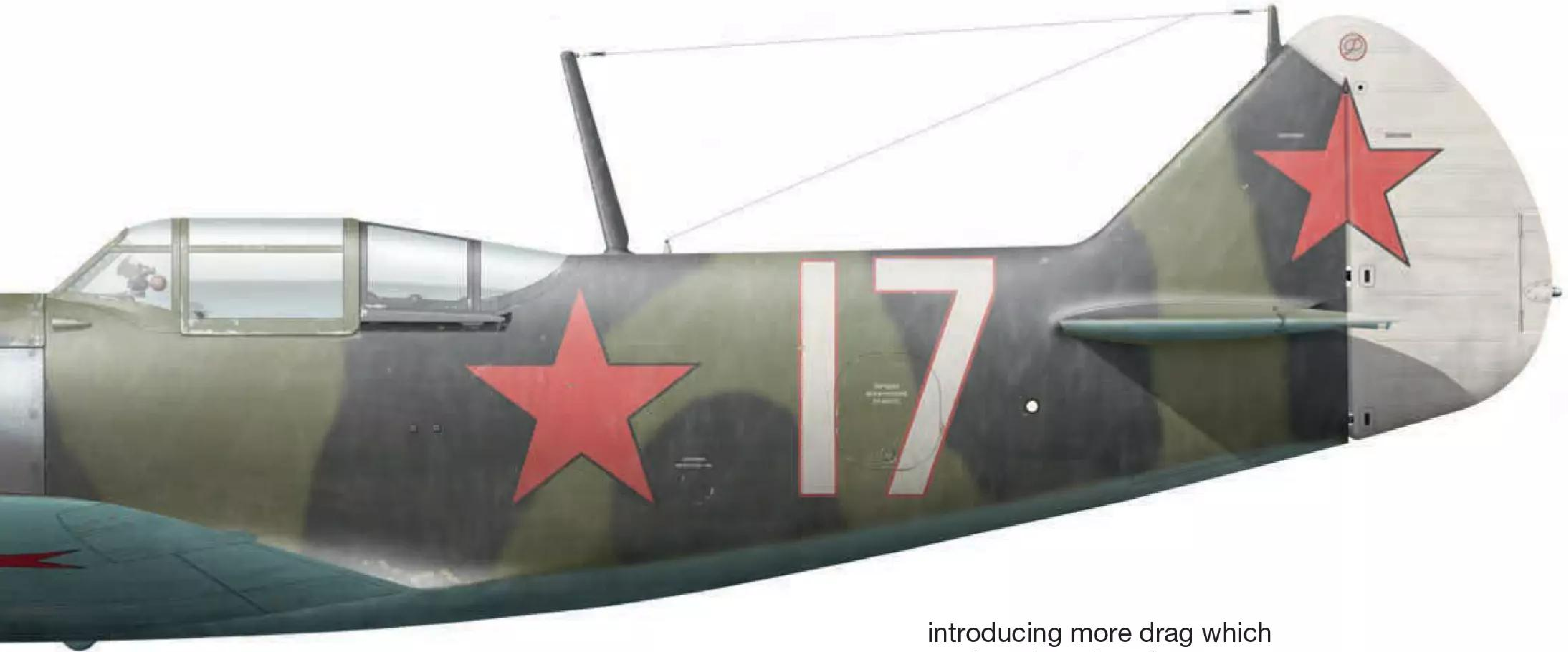
**Two-times Hero of the Soviet Union Kapitan Vitaliy Ivanovich Popkov of the 5 GIAP flew this aircraft while based in the Lvov area during the autumn of 1944. He flew 478 combat missions and achieved 41 victories in air combat plus one shared.**

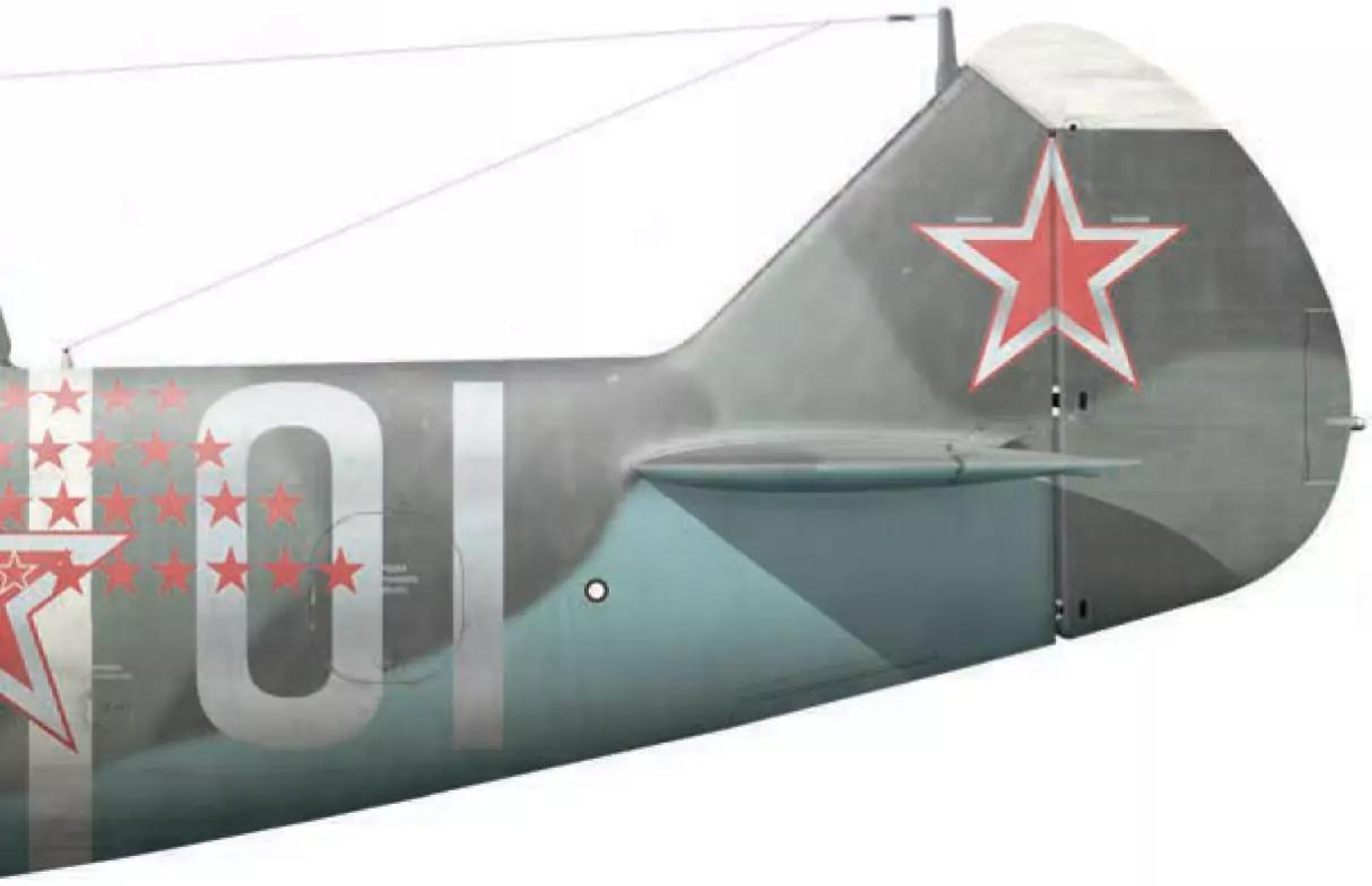


## LAVOCHKIN LA-5 ▼

**The inscription on the side of this famous La-5 reads 'For the Motherland!' It was flown by Kapitan Ivan P Laveikin, commander of the 2nd AE, 5th GvIAP on the Stalingrad front during the winter of 1942-1943. Laveikin achieved 24 victories in air combat plus 15 shared.**





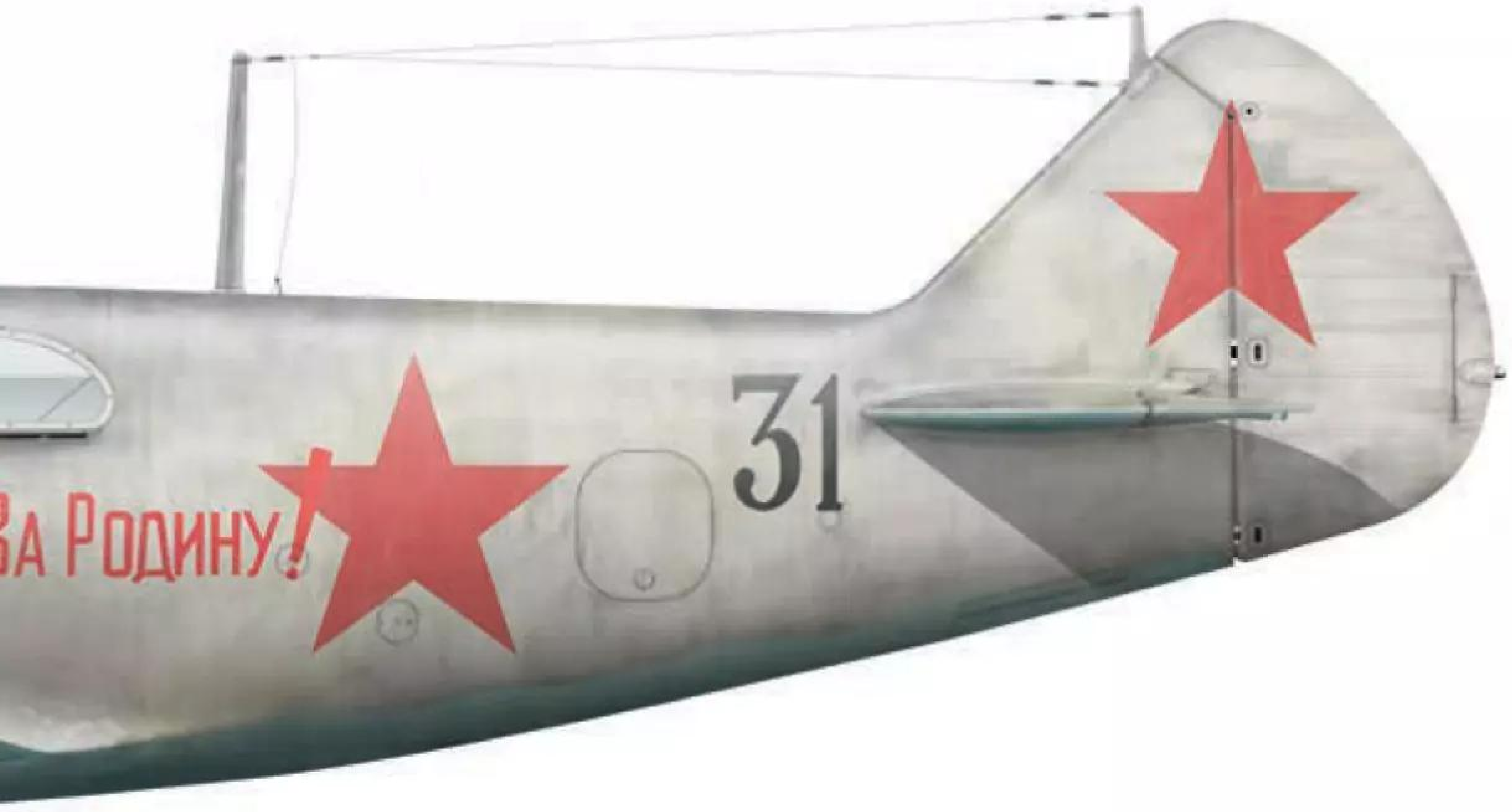


introducing more drag which again reduced performance. The raw power supplied by the ASh-82FN, particularly at low to medium altitude, and the aircraft's reduced weight put its performance on a par with that of the Bf 109s and Fw 190s it was now facing in combat. Full series production of the La-5FN continued throughout 1943 but the ASh-82FN proved more difficult to manufacture than its forebears and La-5FN production was severely hampered by a lack of powerplants.

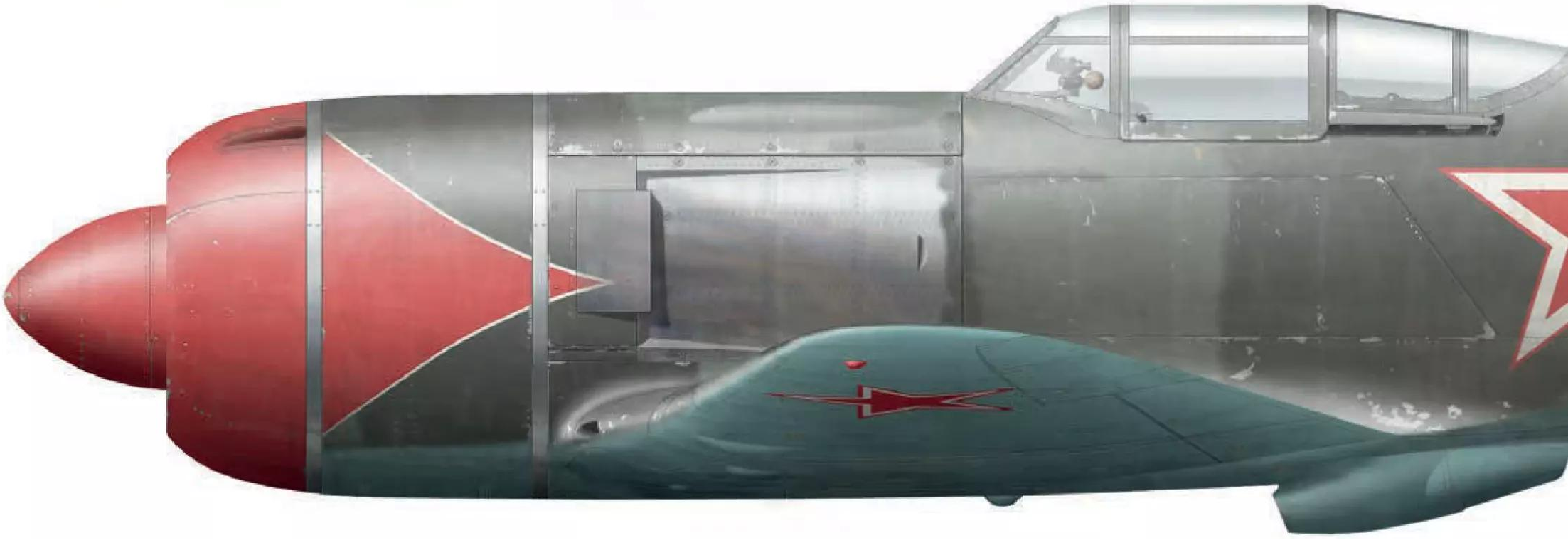
Not only that, the ASh-82FN also proved more difficult to maintain in the field, meaning that the La-5FN was more frequently put out of action by mechanical problems than its contemporaries – including the LaGG-3 and La-5F.

Around 30 examples of the two-seater trainer version of the La-5 were constructed, the La-5UTI. In order to accommodate the second cockpit for the instructor, the aircraft was stripped of its bulletproof glass, armoured seat backrest, radio equipment and oxygen system.

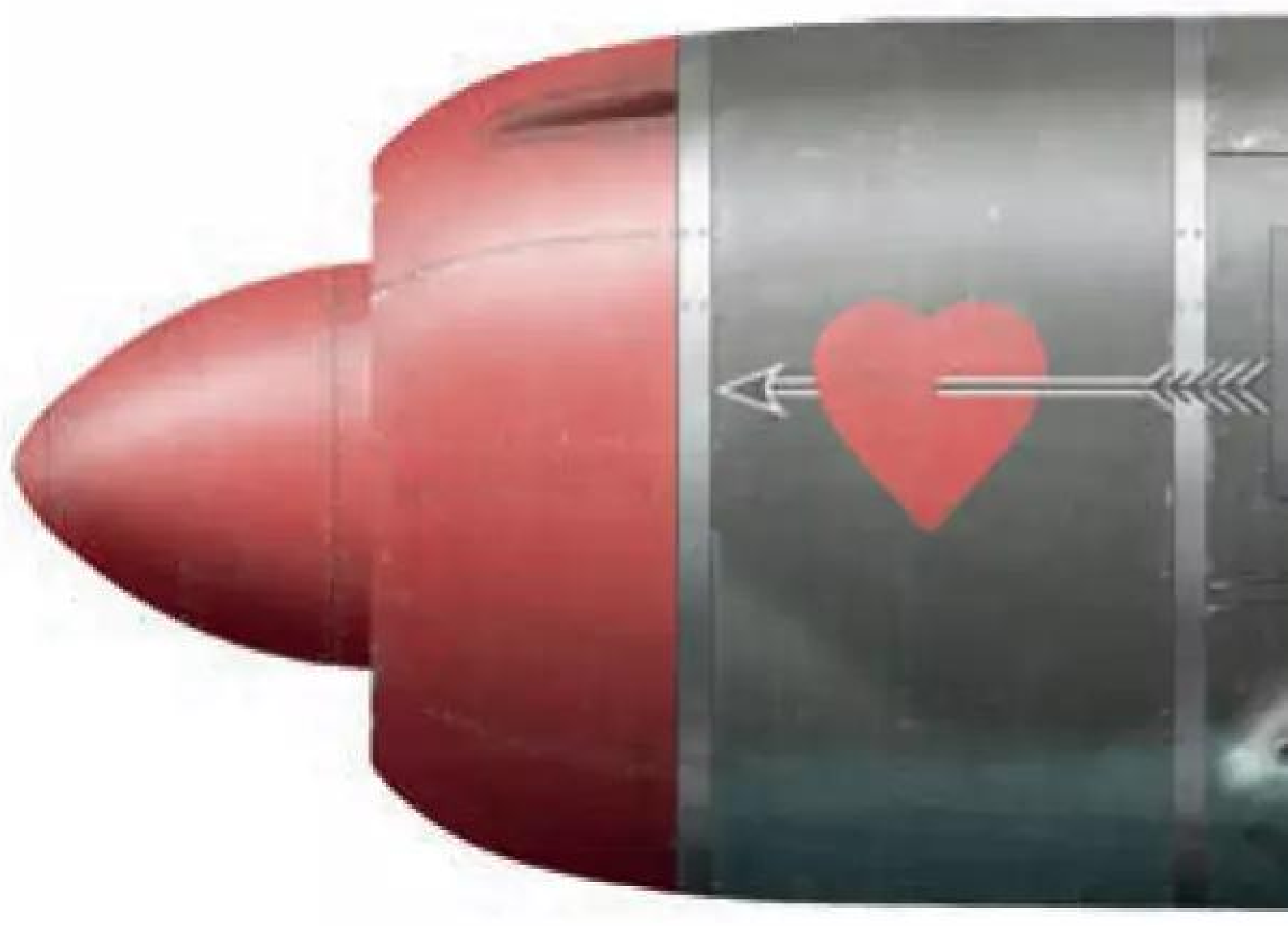
Some 9920 La-5s were built in total, 1500 of them La-5FNs. Series production of the type was cancelled in March 1944 to make way for the Lavochkin fighter family's final wartime upgrade – the La-7 – but so many parts had been produced that new aircraft continued to be assembled up to October 1944. •



# LAVOCHKIN LA-7



**The wartime evolution of the LaGG-3 reached its zenith with the La-7. It embodied countless hours of intensive development work and like the La-5 before it proved to be a match for the Luftwaffe's last crop of high performance fighters.**

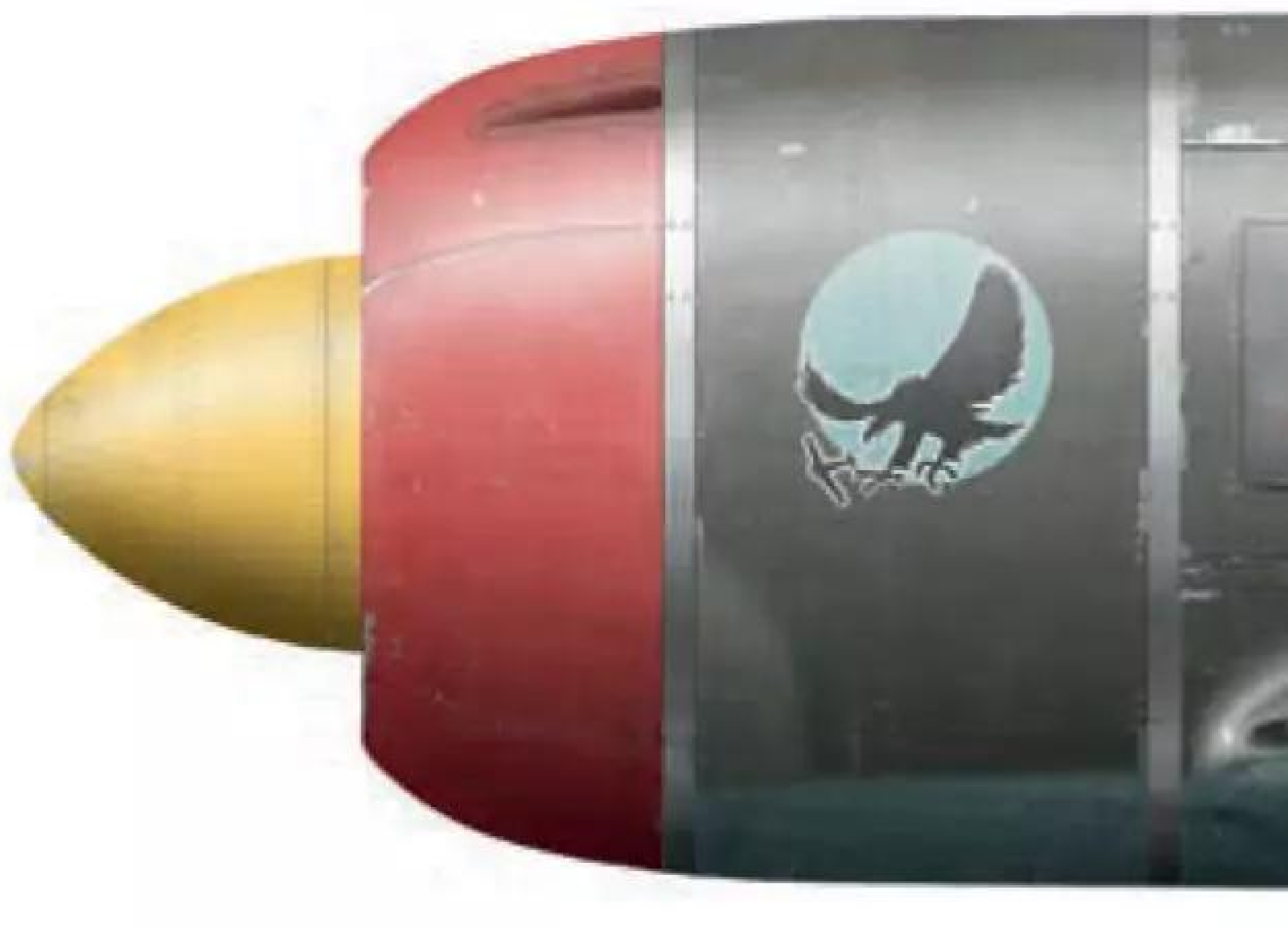


1944-1950

With production of the LaGG-3 winding down and production of the La-5FN in full flow, Lavochkin began working towards the type's next phase of development. The La-5's aerodynamic form had already been the subject of extensive wind tunnel testing to create the La-5FN but this now progressed further, as did work on lightening the aircraft.

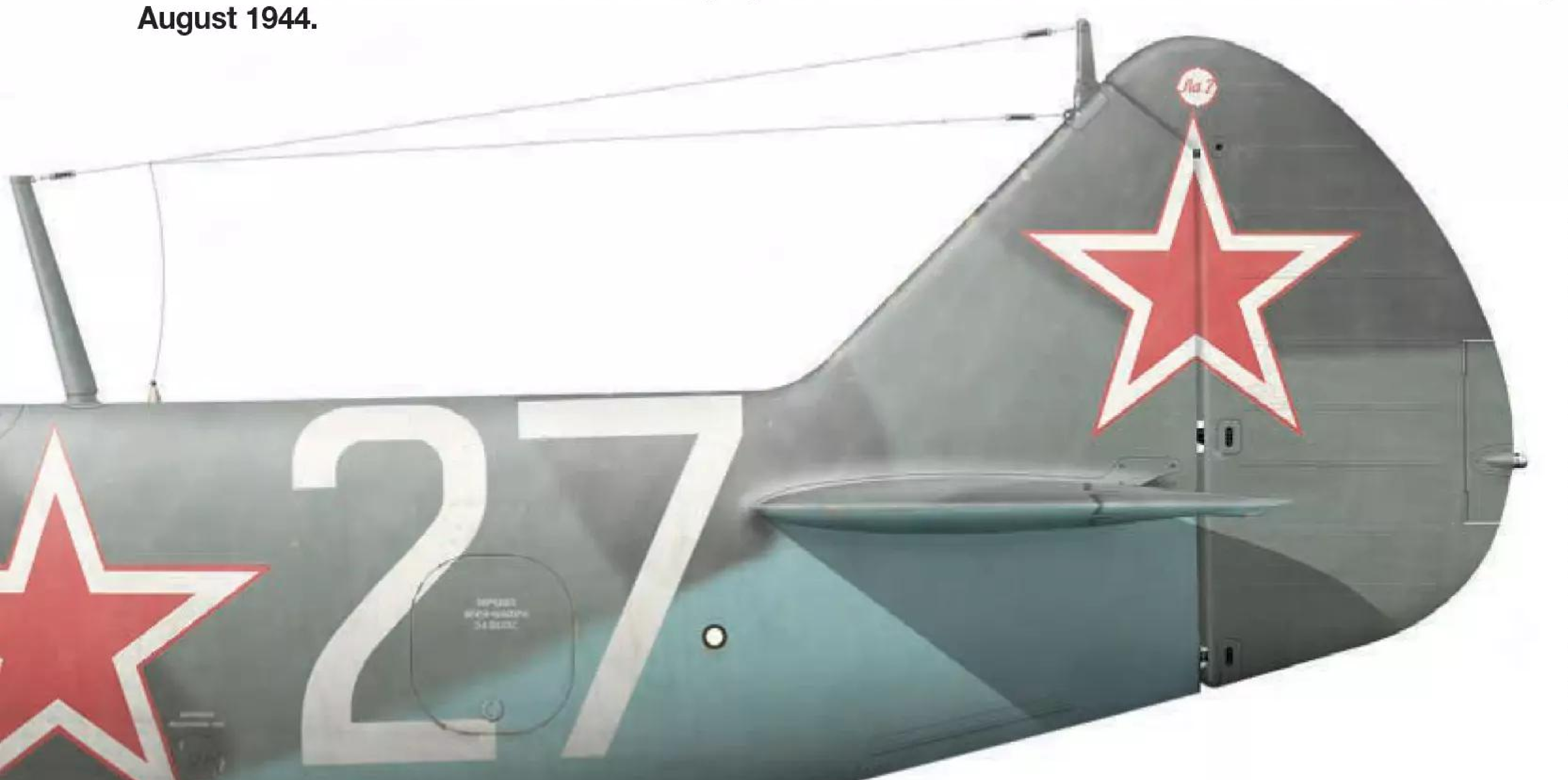
Wooden wing spars were replaced with metal ones and further measures were taken to seal gaps in the engine cowling and fuselage panelwork – particularly by reducing the overall number of individual panels. The oil cooler, previously installed in the lower section of the engine cowling, was moved back to the underside of the centre fuselage, just below and to the rear of the cockpit.

While the La-5FN's ASh-82FN engine was retained, each cylinder was now given its own exhaust pipe, the propeller was reshaped to perform more efficiently at higher speeds and a larger spinner was installed. The fillets at the points where the wings joined the fuselage were also redesigned, the main landing gear was fitted with longer shock struts and the tailwheel strut was shortened. It was recommended that a metal roll bar, to protect the pilot in the event of a nose-over, be fitted to the rear of the cockpit but this modification was omitted, as was a proposal to fit a trio of B-20 cannon in place of the La-5's twin cannon.



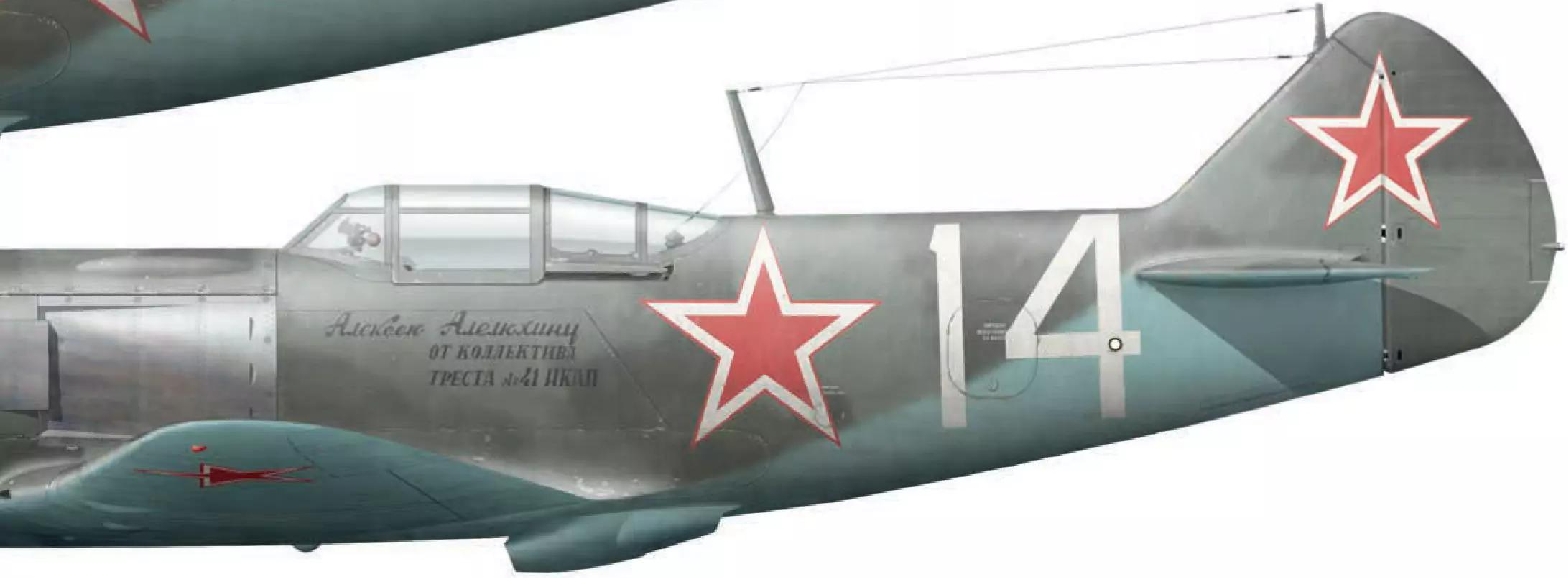
## LAVOCHKIN LA-7

The top Allied ace of the Second World War, Kapitan Ivan Mikitovich Kozhedub of the 176 GIAP, flew this aircraft on the 1st Belorussian front in Germany during February 1945. During 330 combat sorties, Kozhedub scored 62 victories in air combat – including the destruction of a Me 262 jet fighter. Forty-six of his victories were achieved while flying a La-5 and the rest after he converted to the La-7 during August 1944.



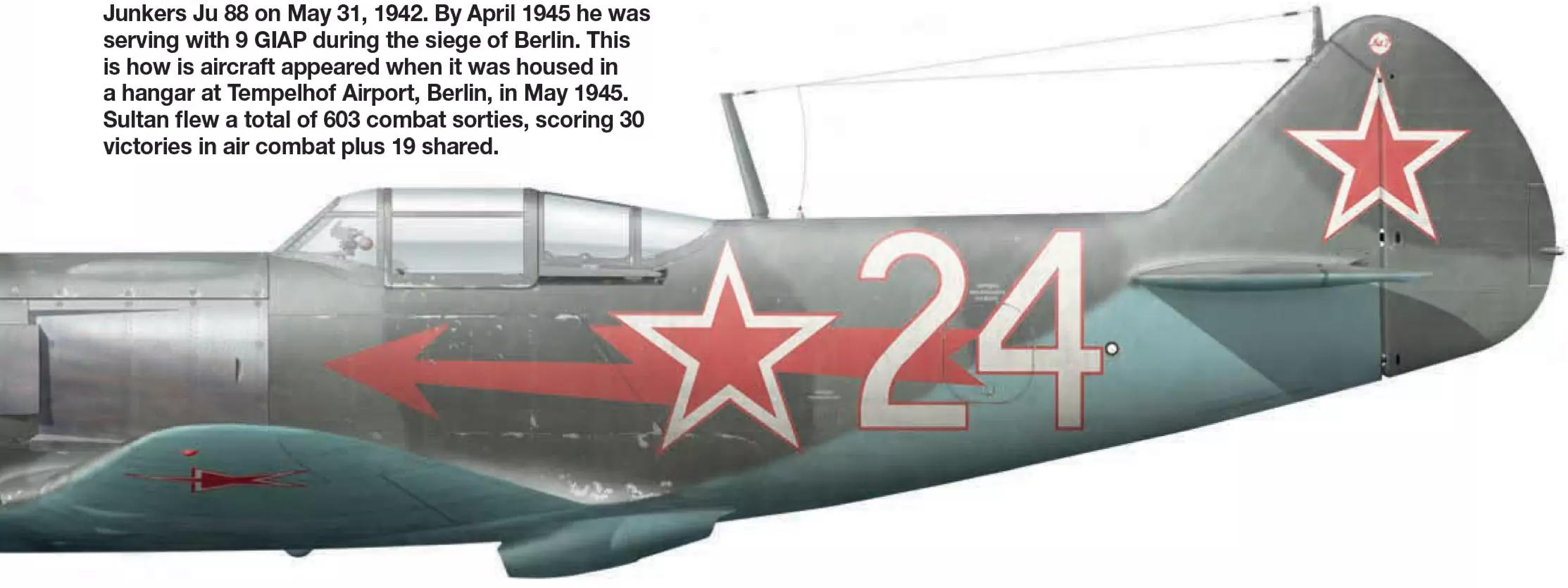
## LAVOCHKIN LA-7

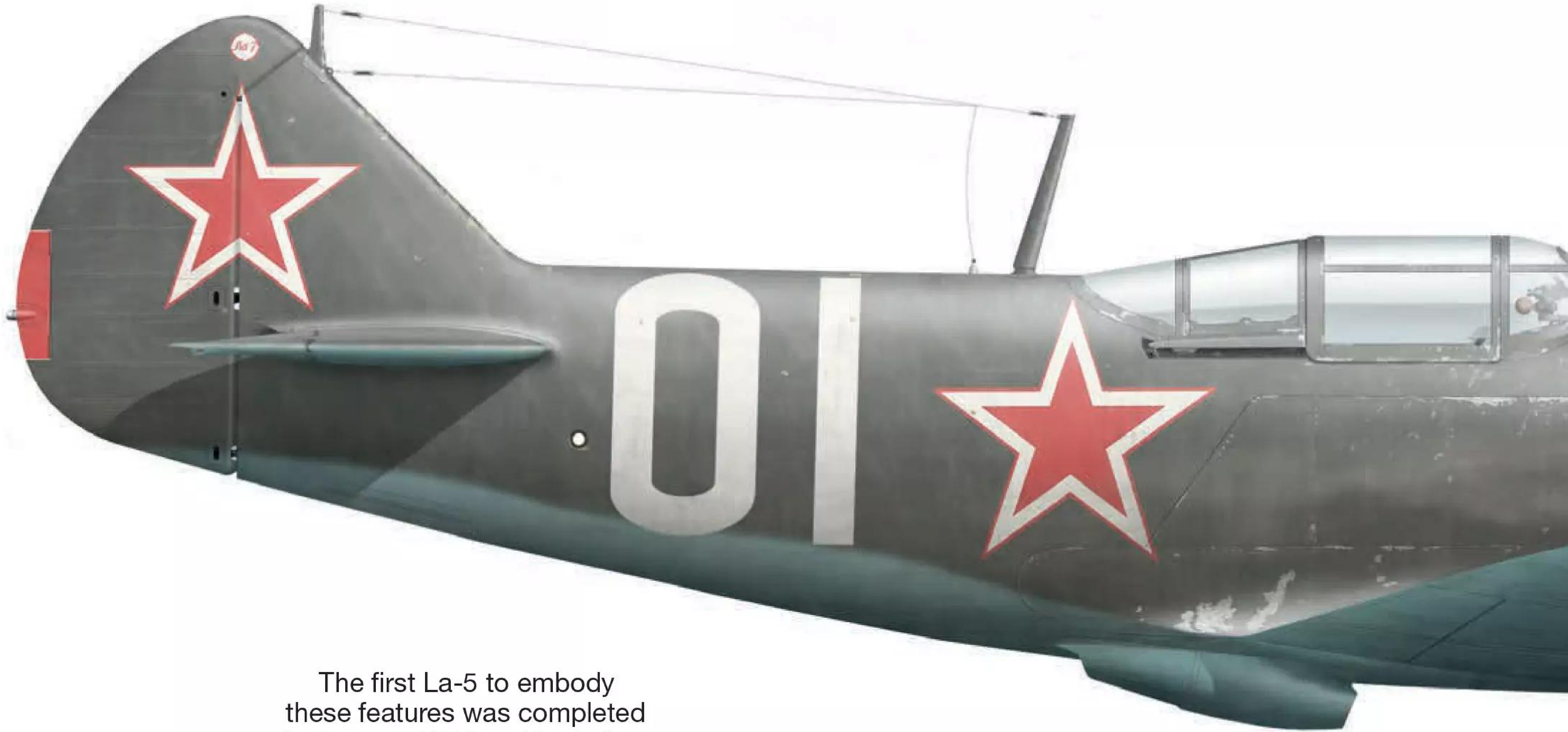
Some of the fiercest fighting of the final stages of the Second World War took place at Königsberg – a Prussian fortress city that was besieged by the Red Army for three months, beginning towards the end of January 1945. This La-7 was flown by Mayor Aleksey Alelyukhin of the 9 GIAP in the Königsberg area during March 1945, the height of the siege. Alelyukhin flew 600 combat missions during the war and achieved 40 victories in air combat plus 17 shared. The inscription on the fuselage reads: “To Aleksey Alelyukhin from the collective of factory No. 41 of the People’s Commissariat of Aviation Industry.”



## LAVOCHKIN LA-7

Mayor Amet-Khan Sultan achieved his first combat victory by ramming his Hawker Hurricane into a Junkers Ju 88 on May 31, 1942. By April 1945 he was serving with 9 GIAP during the siege of Berlin. This is how is aircraft appeared when it was housed in a hangar at Tempelhof Airport, Berlin, in May 1945. Sultan flew a total of 603 combat sorties, scoring 30 victories in air combat plus 19 shared.





The first La-5 to embody these features was completed in January 1944 and tested from February to March. Although work was suspended after just nine flights due to engine failure, the cumulative effect of the changes was dramatic – the upgraded La-5 could now manage 422mph at 20,000ft. This made it some 30-40mph faster even than the La-5FN.

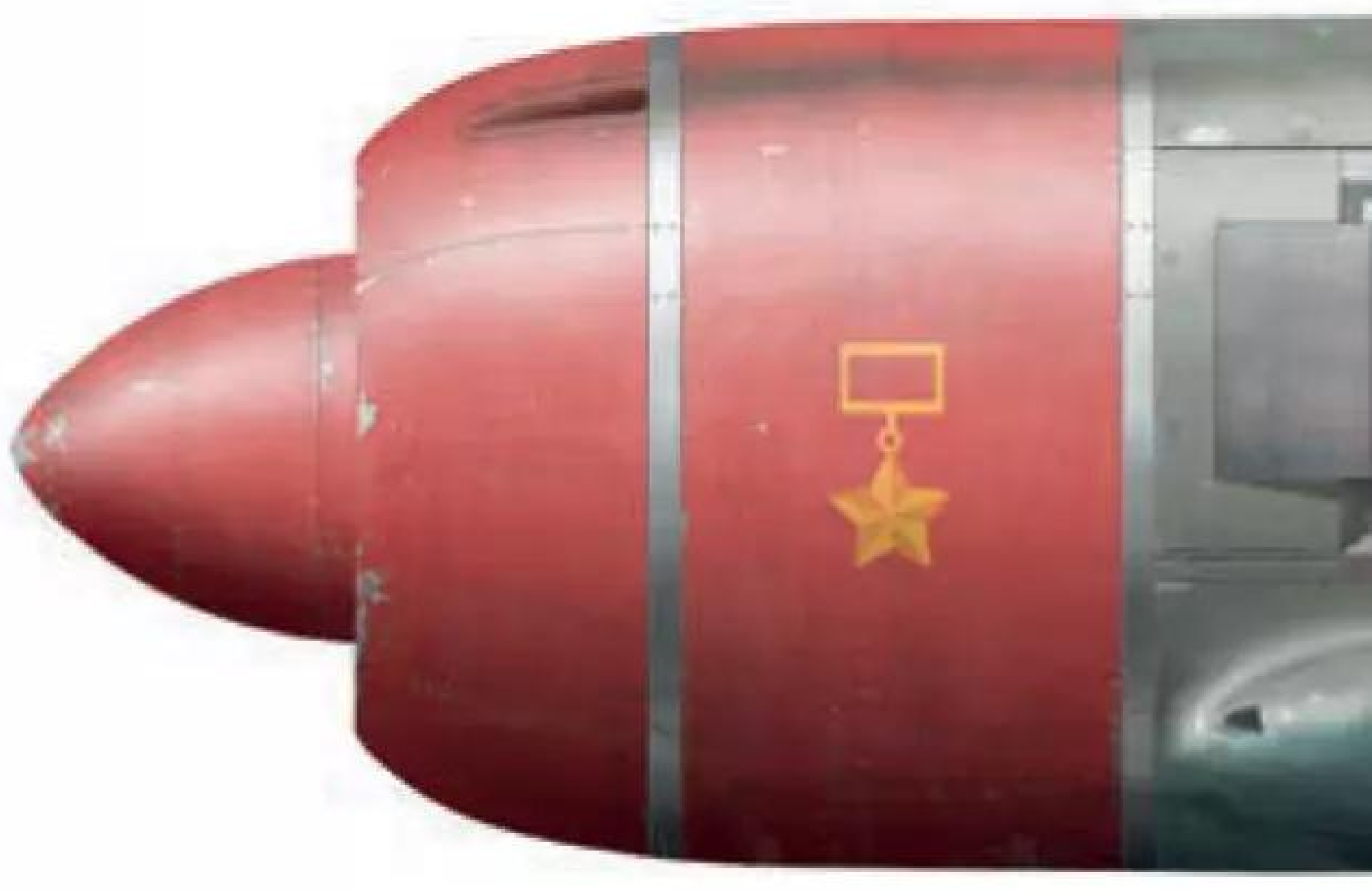
The new version was given the designation La-7 and approved for production. The early war Soviet fighters – the LaGG-3, MiG-3 and Yak-1 had suffered from poor supply infrastructure, appalling factory workmanship and hasty design but by 1944 most of these problems had been overcome. The lines producing the La-7 were more efficient and better supplied. While the finished aircraft retained the no-frills character of their forebears, there had been huge improvements in quality.

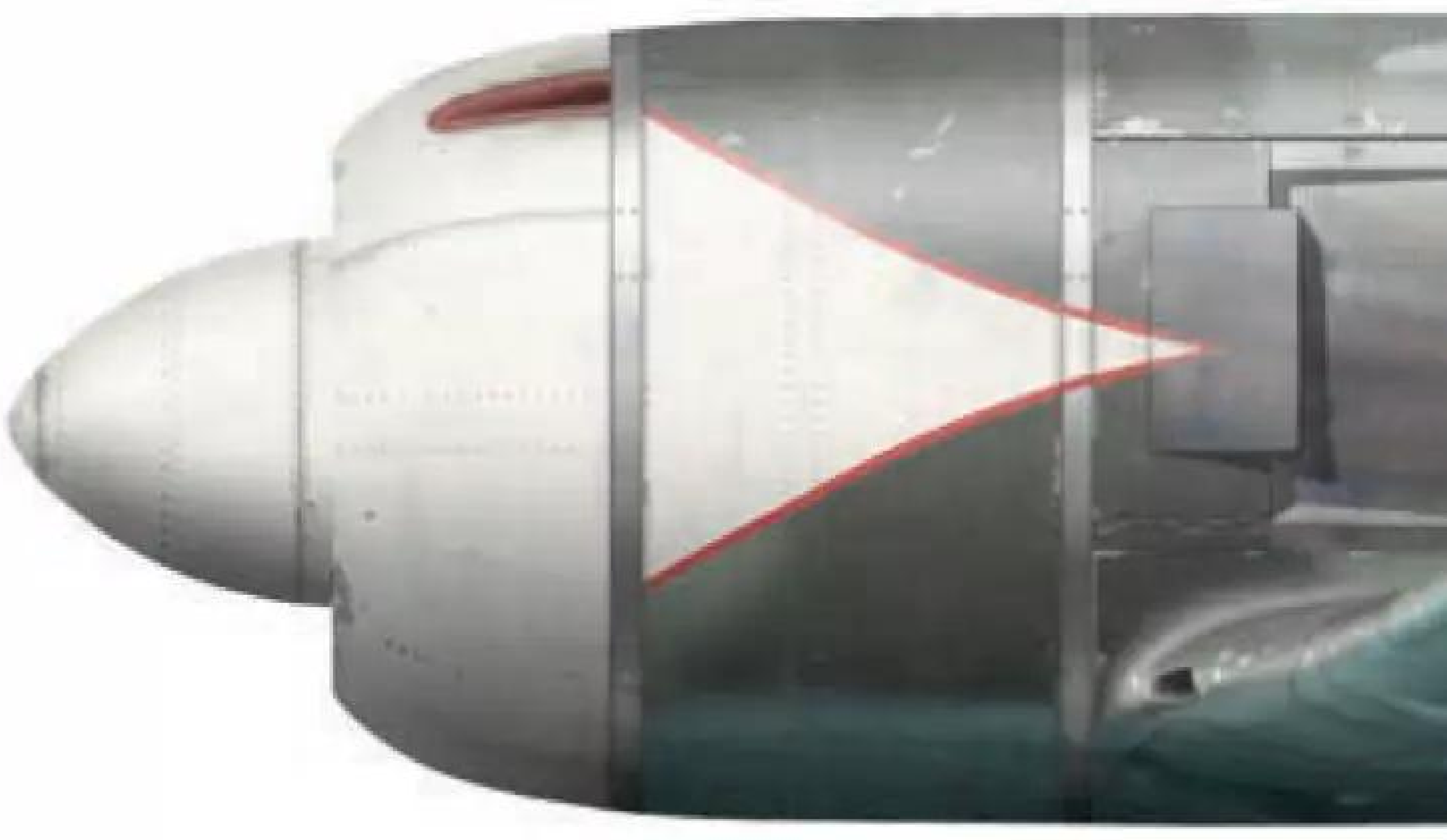
As had become customary, the performance of the full production model La-7 could not quite manage the sparkling performance of the prototype, with a top speed of 397mph at 20,000ft. This puzzled the Lavochkin engineers, since the original machine had managed to reach its top speed complete with weaponry and other peripherals.

An investigation was begun to work out why performance had dipped so significantly. This determined that the cowling was still being inadequately sealed, causing drag, and the propeller's new form had not been made properly. In addition, the ASh-82FN was found to be performing below the manufacturer's specification – which resulted in Shvetsov being required to improve the standard of its production output.

With all of these problems resolved, production La-7s were capable of a top speed of 418mph at 20,000ft. At the same altitude, the Bf 109 G-6 could only manage 404mph and the Fw 190 A-8 only 400mph. The Bf 109 K-4, however, deliveries of which began in October 1944, could reach 441mph. The Fw 190 D-9's top speed was 424mph.

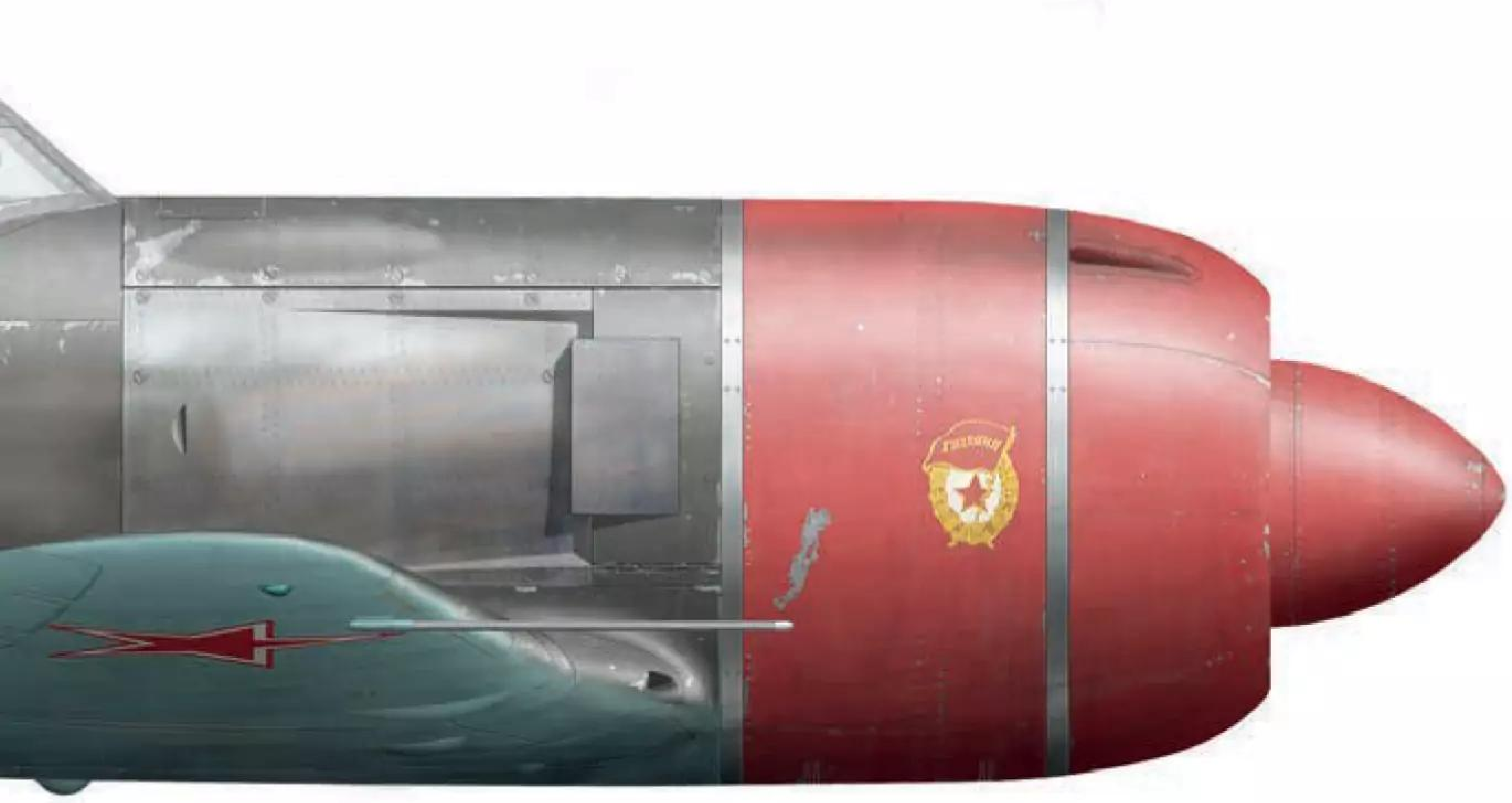
Unfortunately, it proved extremely difficult to bring production aircraft up to this standard. Sample aircraft were pulled from production lines in September 1944 and spot tested. This revealed that the typical La-7 still lagged well behind its target performance, at between 407 and 408mph at 20,000ft. However, the aircraft's rate of climb was better than expected, and comparative tests rated





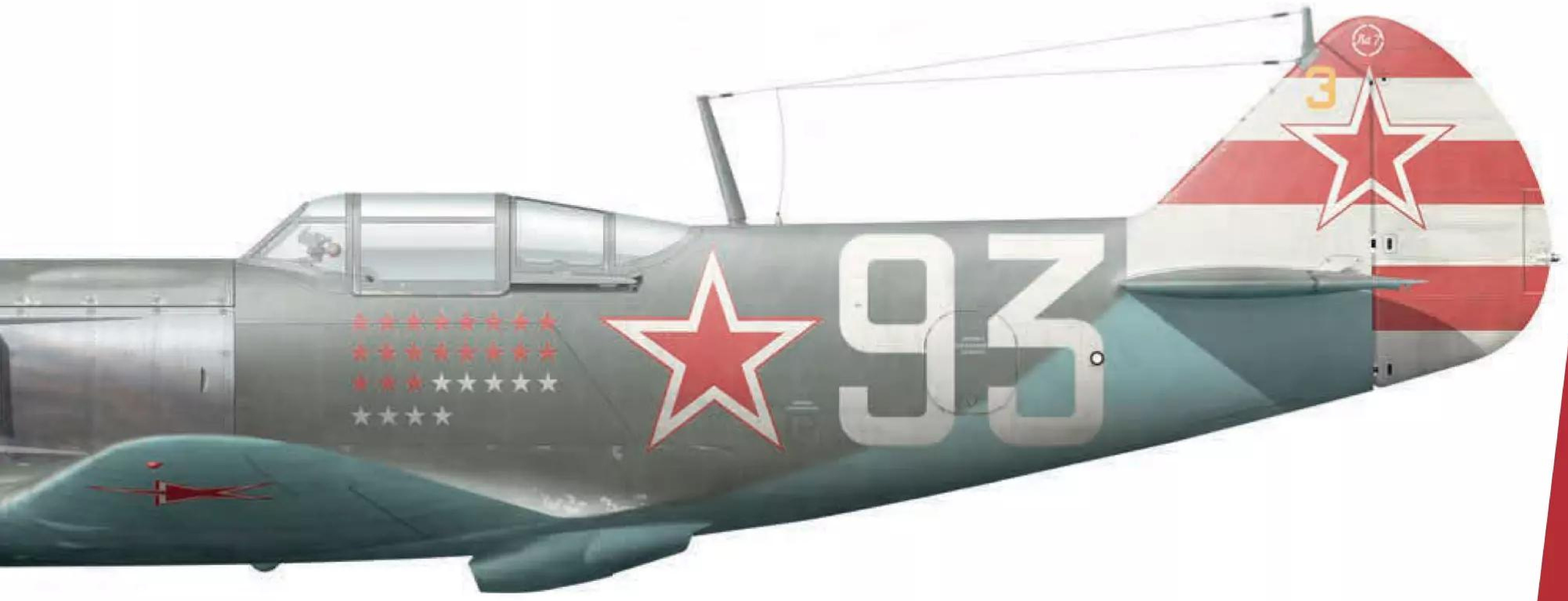
## LAVOCHKIN LA-7

This aircraft was flown by pilots of the 176 GIAP during the siege of Berlin, April 1945.



## LAVOCHKIN LA-7

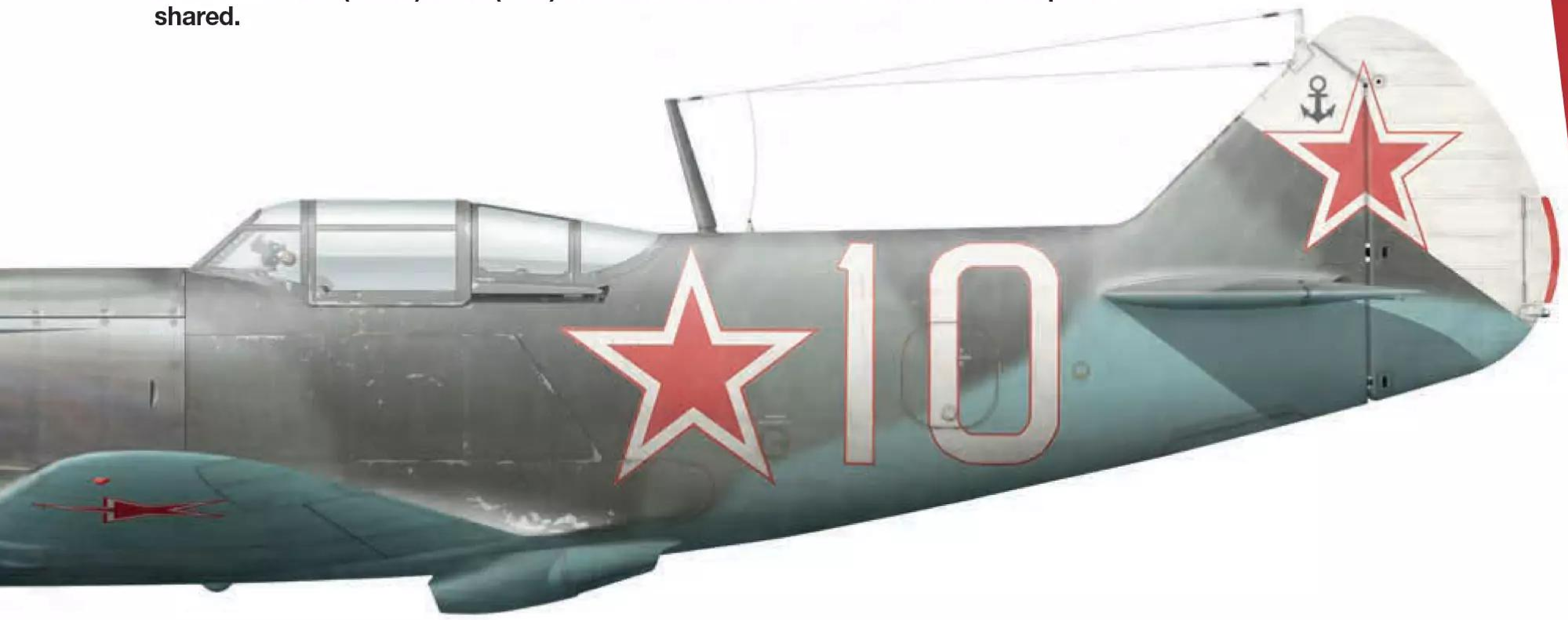
'White 93' was flown by Podpolkovnik Sergey Fedorovich Dolgushin, commander of the 156 IAP, during April/May 1945. Dolgushin scored 17 victories in air combat plus 11 shared, which puts him just outside the top 100 Soviet aces of the Second World War. Nevertheless, this aircraft has subsequently become more famous than many of those flown by the top 100 scorers.



**THE LA-7 WAS ONE OF THE MOST POWERFUL WW2 FIGHTERS**

## LAVOCHKIN LA-7

Just as the ruined fortress city of Königsberg, Prussia, was falling to Soviet forces in April 1945, this La-7 was being flown by Mayor Vasili Zaitsev of the 4th GvIAP of the Red Banner (Baltic) Fleet (KBF). Zaitsev scored 34 victories in air combat plus 19 shared.



its performance in this regard as better than that of the Bf 109 G-6.

A handful of La-7s from the first production batches suffered from structural failure due to a weakness of the main spar. This was fault was traced and resolved – but not before six aircraft and four pilots had been lost.

The type's major vice in front line service was a propensity for engine failure. The aircraft was typically operated from rough forward airstrips and as a result the ASh-82FN's air intakes tended to ingest dirt, dust and sand whipped up by the propeller at an alarming rate. In addition, by the final phase of the war, the aircraft's two cannon provided an insufficient weight of fire against more heavily armoured targets.

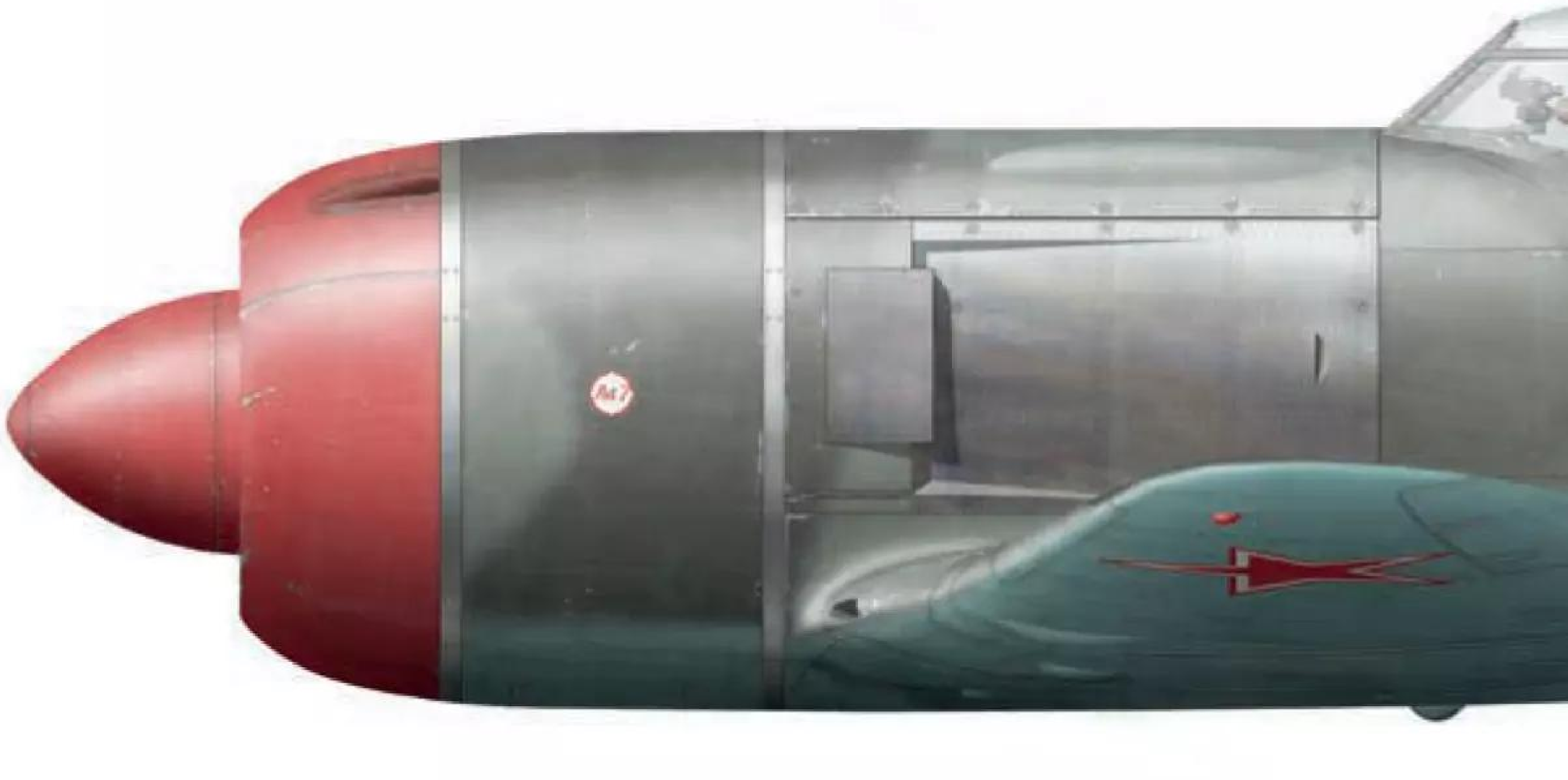
A total of 5753 La-7s were built up to the end of the war. A handful of examples built at the end of the production run were fitted with the trio of B-20 cannon originally envisioned for the type.

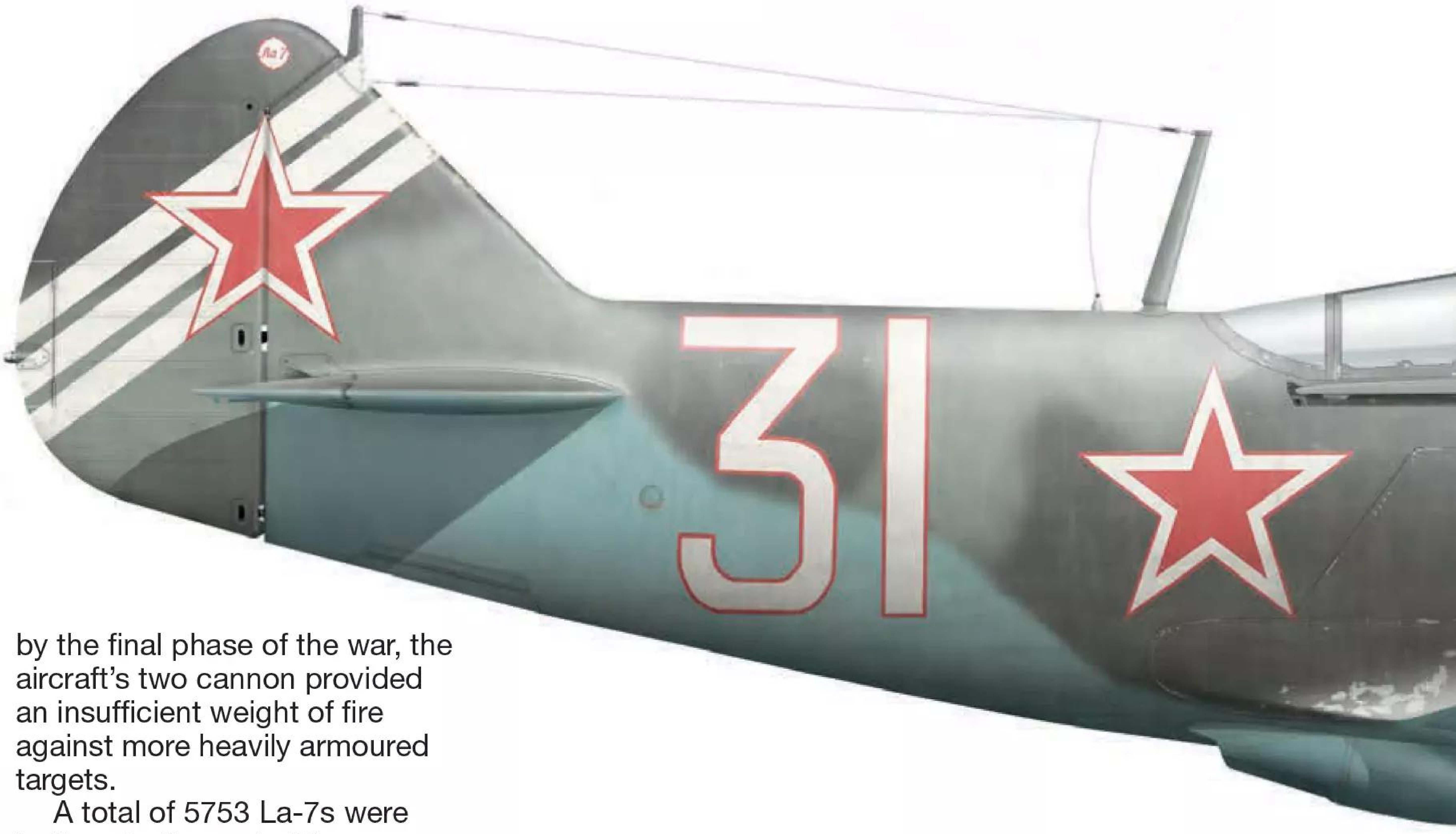
Another development of the La-7 was the trainer version – the La-7UTI. Rather than rush it into production, Lavochkin took its time to perfect the aircraft's design. The inclusion of a direction finder and gun camera plus numerous other changes resulted in a two-seat La-7 that was substantially heavier than the single-seater and which handled rather differently to the aircraft it was supposed to be training pilots for.

DIRE AIRFIELDS MADE OPERATIONS DIFFICULT FOR LA-7 UNITS

### LAVOCHKIN LA-7 ▼

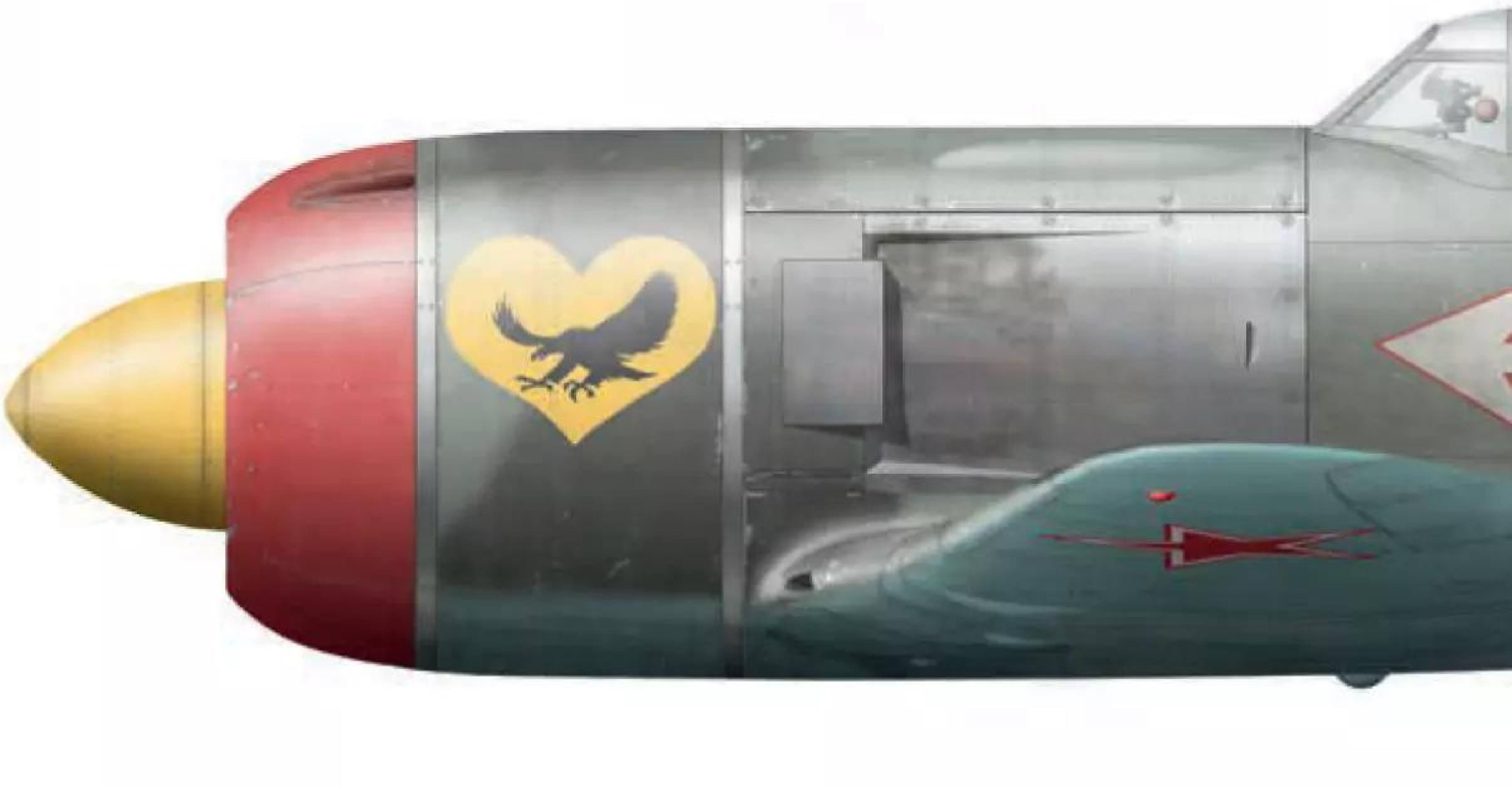
**This aircraft was flown by Kapitan Vitaly Ivanovich Korolev of the 482nd IAP, based at Prague, Czechoslovakia, during the spring of 1945. He achieved 21 Victories in air combat plus 10 shared.**

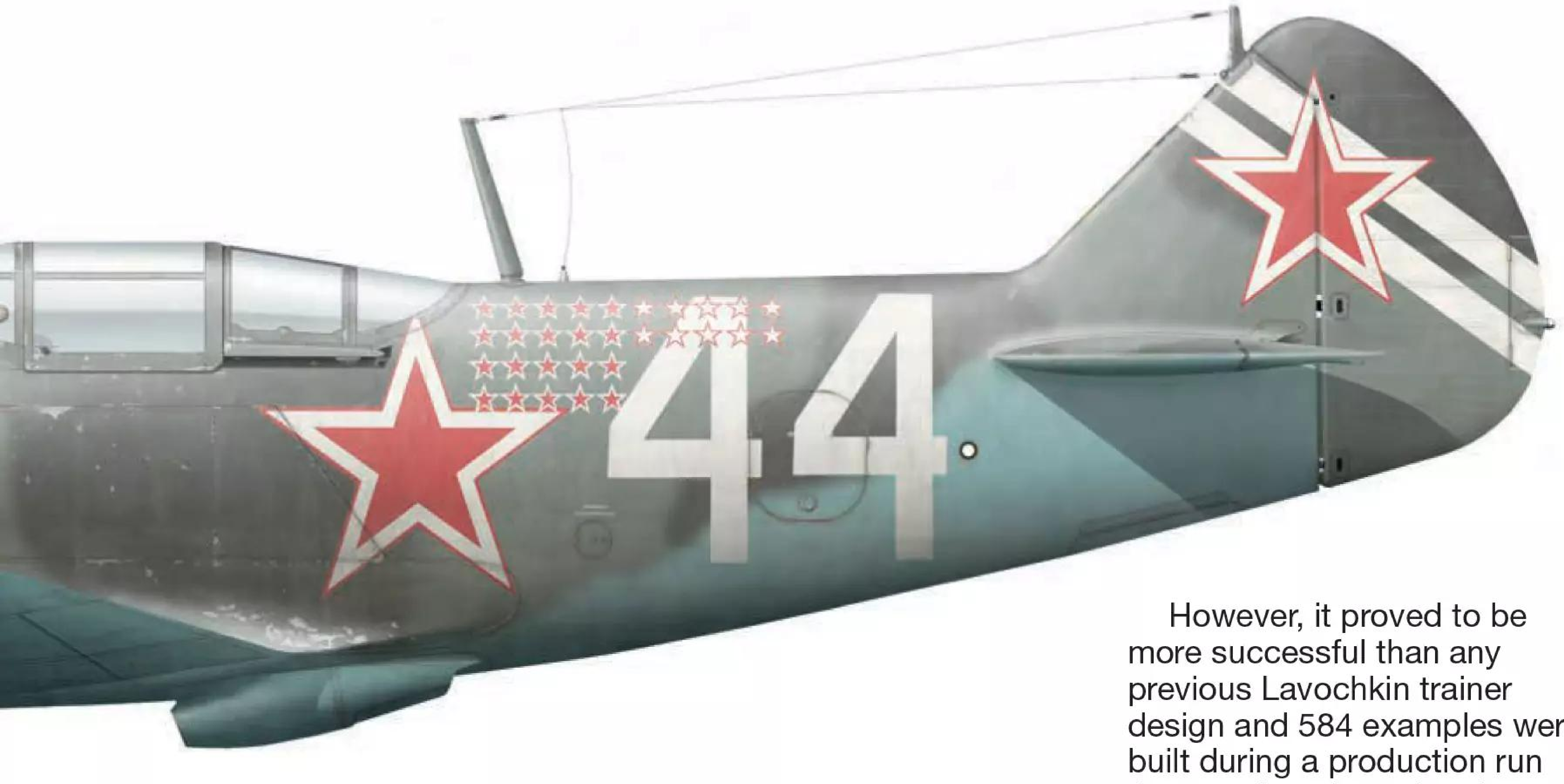




### LAVOCHKIN LA-7 ▼

**Kapitan Pavel Golovachev of the 9th GvIAP flew 'White 23' while based at Wittenberg in Germany during January 1945.**

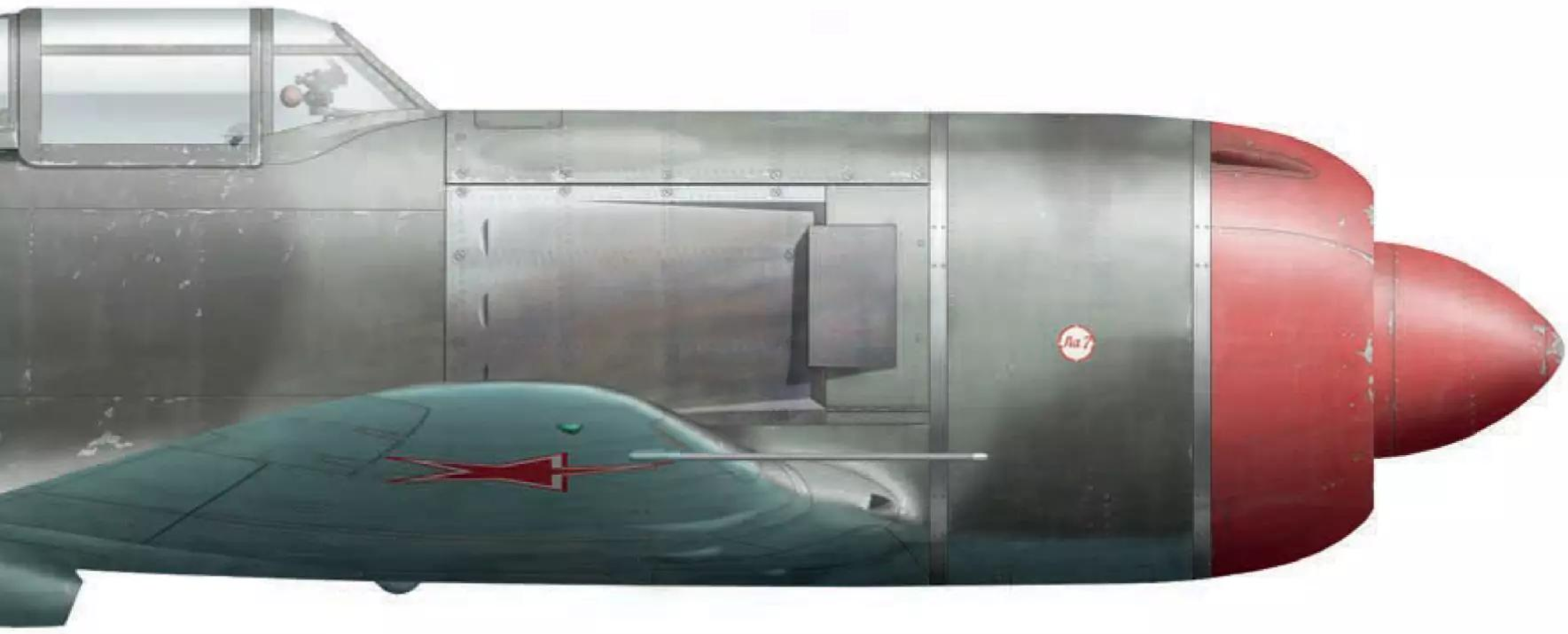


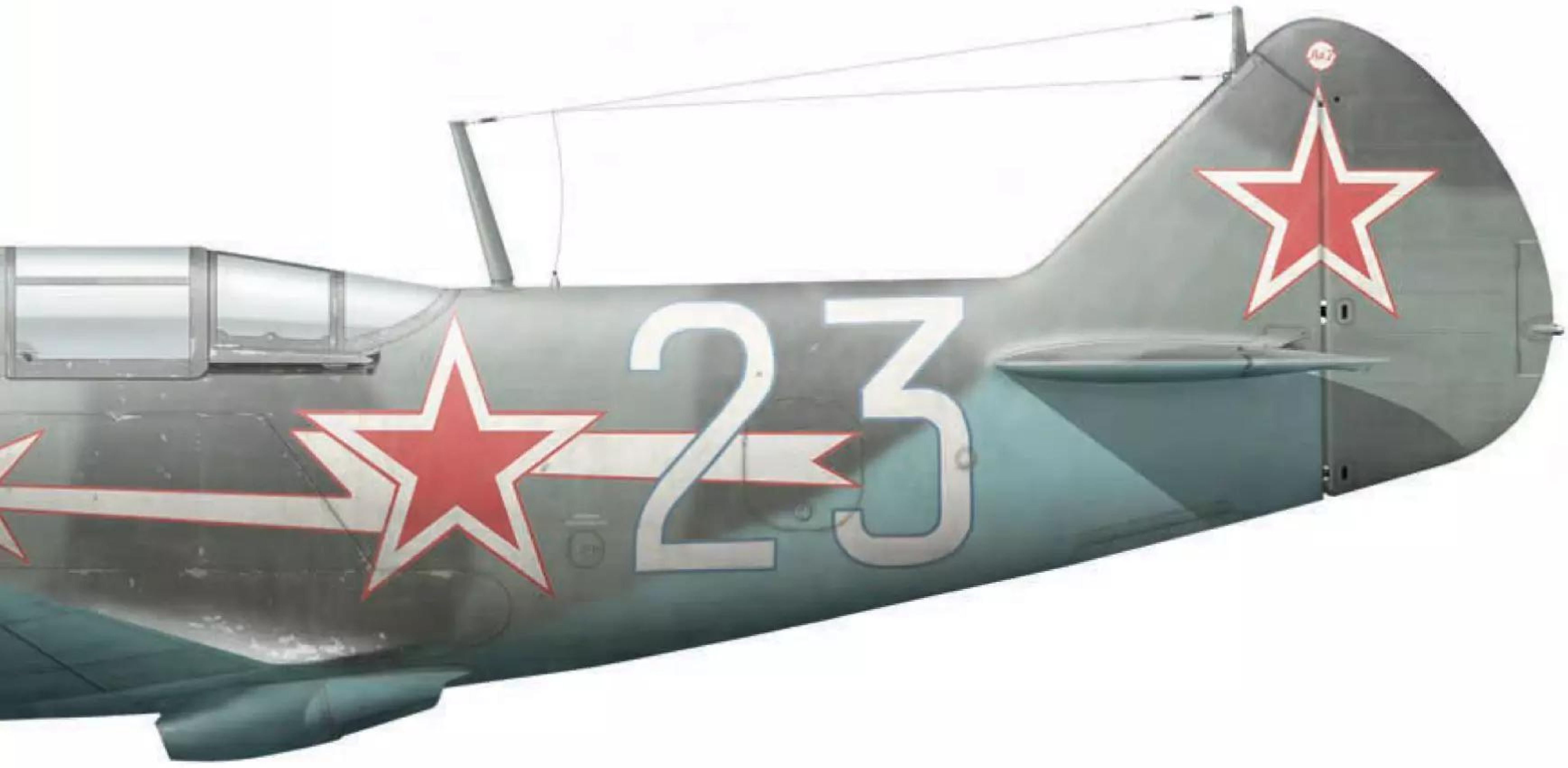


**LAVOCHKIN LA-7** ▼

**Pilots of the 937th IAP flew this aircraft while stationed at Kbely in Czechoslovakia during 1945.**

However, it proved to be more successful than any previous Lavochkin trainer design and 584 examples were built during a production run that continued on after the war had ended. The last two La-7UTIs were delivered in 1947. ●

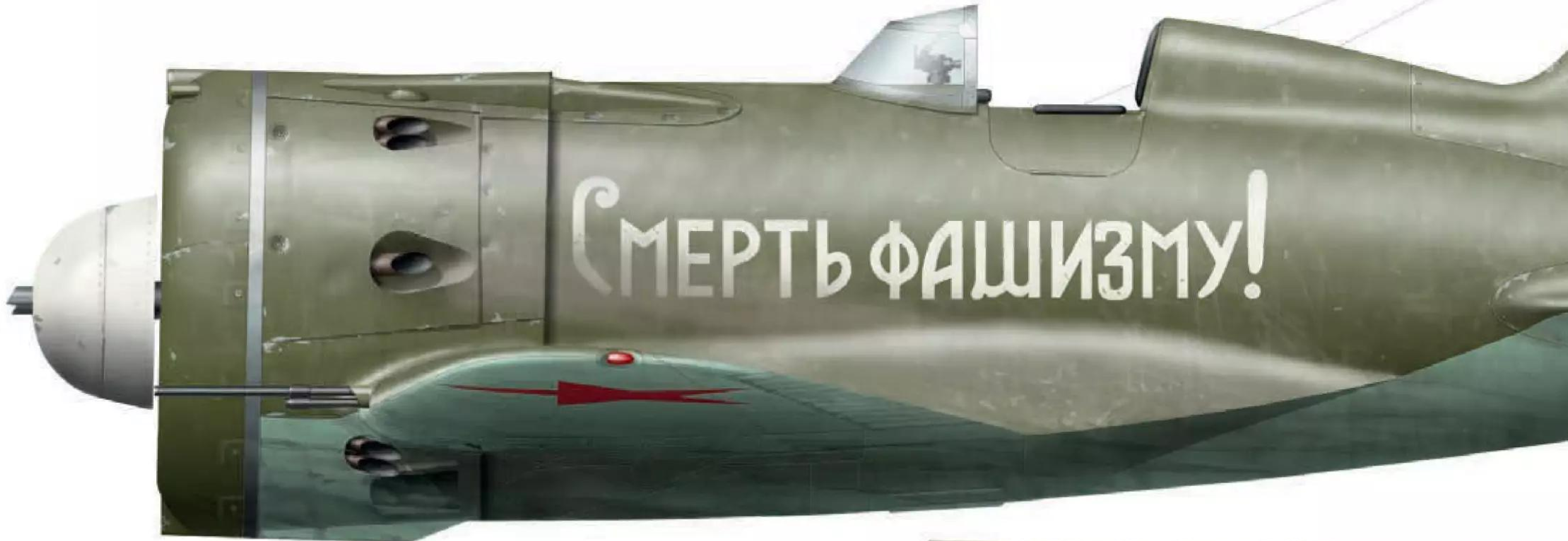


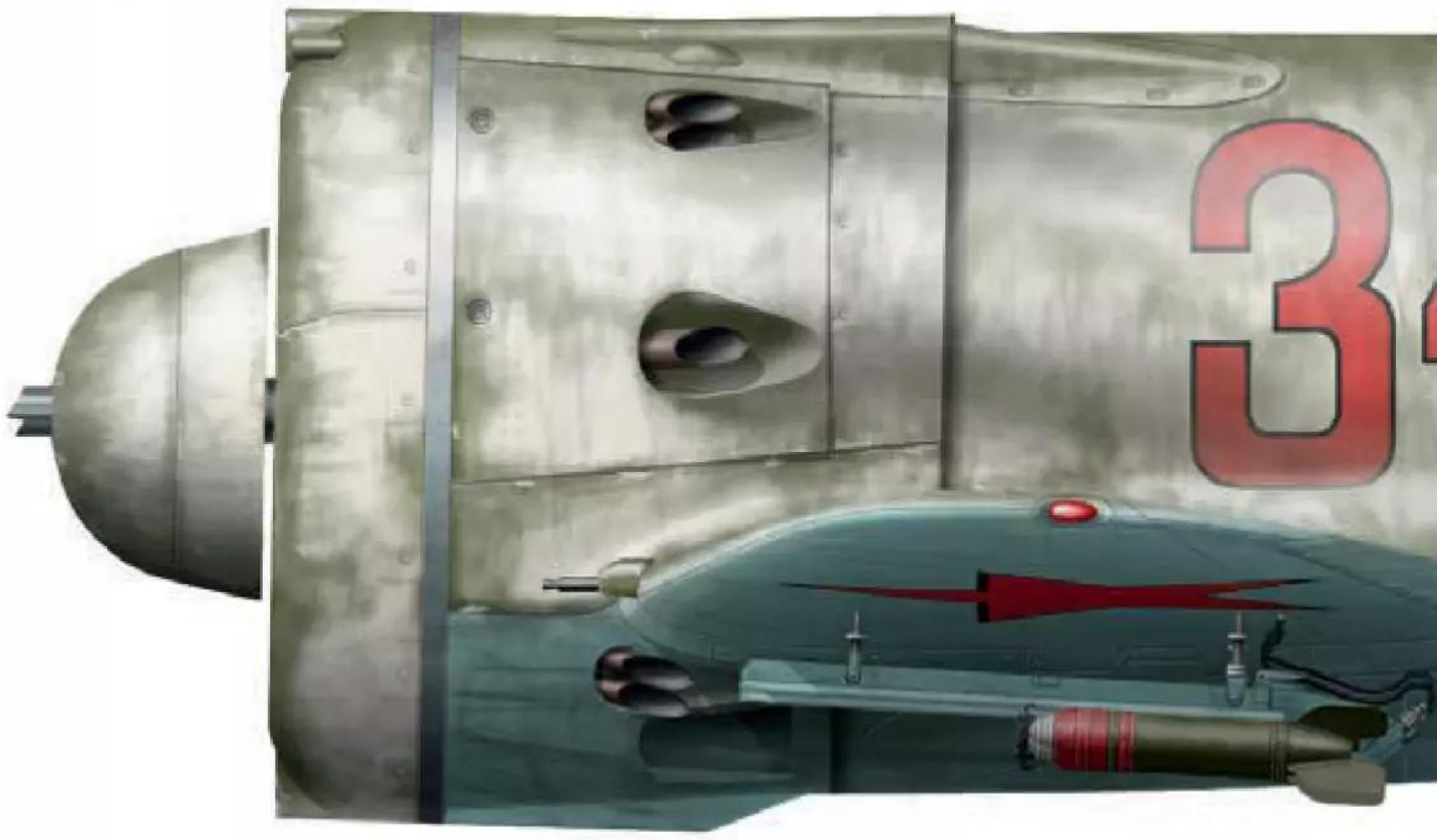


# POLIKARPOV

### POLIKARPOV I-16

**Commonly shown in photographs standing beside someone else's I-16 bearing the slogan 'For Stalin!' this is the aircraft actually flown by Kapitan Boris Feoktistovich Safonov, commander of the 72 SAP/SF, based at Polyarnoye, Murmansk, USSR during September 1941. The slogan reads 'Death to Fascism!' Safonov flew 224 combat sorties and achieved 25 victories in air combat plus 14 shared. He later flew Hawker Hurricanes and Curtiss P-40s. His P-40E was shot down on May 30, 1942, and he was killed.**


Смерть фашизму!



1933-1943

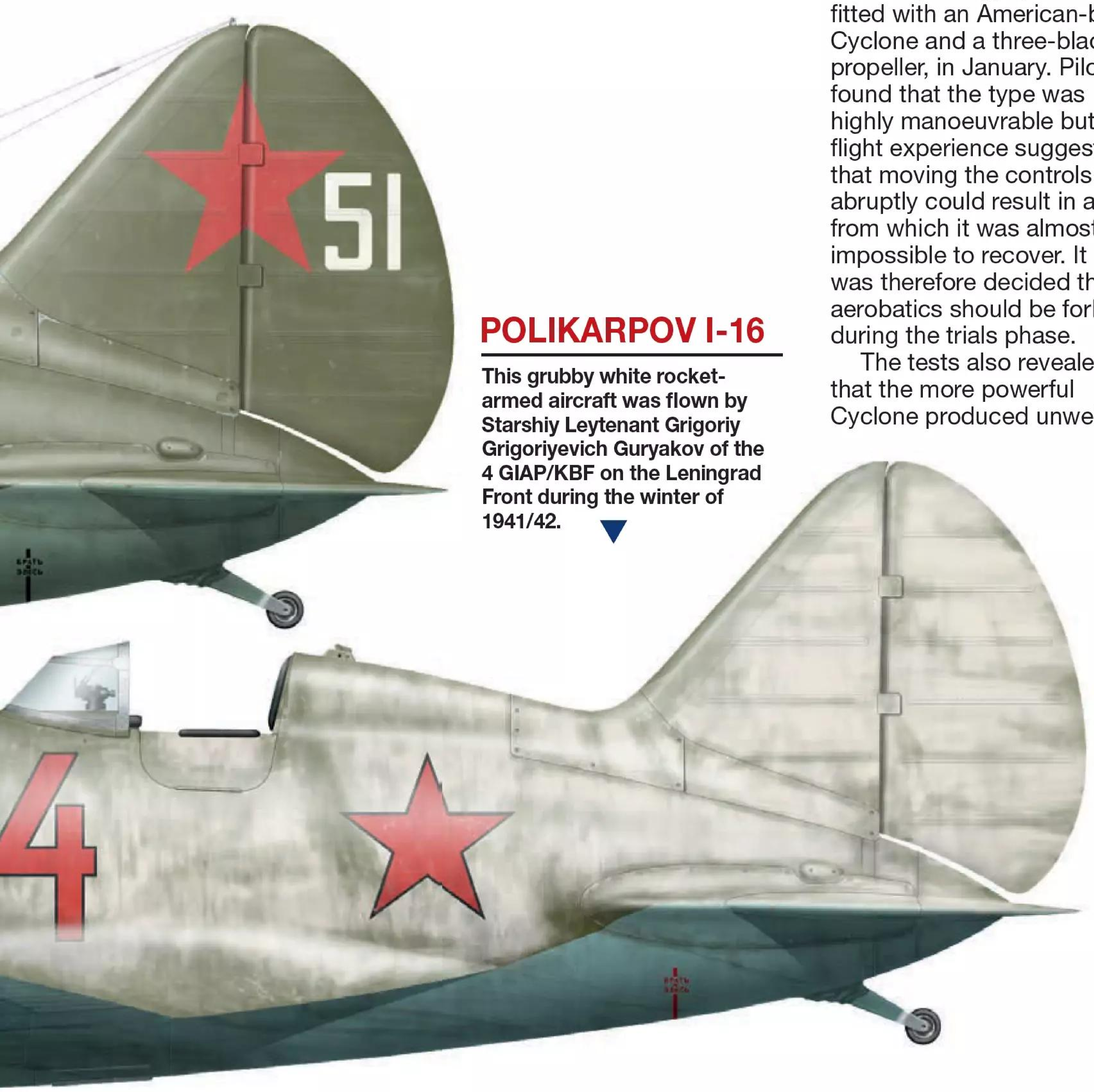
**The diminutive Polikarpov I-16 had faced the Messerschmitt Bf 109 on almost equal terms during the Spanish Civil War and was still the Soviet Union's main fighter when the German army invaded in 1941. But where the Bf 109's development was just beginning, the I-16's was almost over.**

Nikolai Polikarpov became the head of technical development at the Dux Aircraft Factory in 1923, having previously been part of the team who developed the Sikorsky Ilya Muromets heavy bomber for the Imperial Russian Air Service.

He then designed some of the Soviet Union's first biplane fighters – the I-1 and I-3 – before being tasked with the design of the more advanced I-6. When this took longer than expected and proved ultimately unsuccessful Polikarpov, along with 450 of his designers and engineers, was arrested in October 1929 and charged with industrial sabotage. He was then sentenced to death.

Two months later this was commuted to 10 years' hard labour and he was then required to complete work he had previously begun on the I-5 fighter trainer. In July 1931 his sentence was suspended and he was released to work with Pavel Sukhoi on designing the I-15 biplane fighter. At the

# I-16



**POLIKARPOV I-16**

**This grubby white rocket-armed aircraft was flown by Starshiy Leytenant Grigoriy Grigoriyevich Guryakov of the 4 GIAP/KBF on the Leningrad Front during the winter of 1941/42.**

same time, Polikarpov began to work on a monoplane version dubbed the TsKB-12.

Powered by an American 710hp Wright SR-1820-F-3 Cyclone nine-cylinder radial engine, this was designed to be small and light with a hand-crank retractable undercarriage plus a fully enclosed 16in wide cockpit with an Aldis-type gunsight and armour protection for the pilot.

The fuselage was a wooden monocoque and the wings were built around a steel alloy spar and dural ribs with an aluminium skin on the centre and leading edges with the rest being fabric. Directly in front of the cockpit was a 59.4 gallon fuel tank and two 0.30in machine guns were installed in the wings, outboard of the main gear.

Construction of the prototype began in June 1933 but licensing arrangements for the Cyclone engine had not yet been completed so a 480hp Shvetsov M-22, itself a licence-built version of the Gnome Rhône Jupiter, a derivative of the Bristol Jupiter, had to be fitted instead.

The design was so promising that it was scheduled for production on November 22, 1933, and the prototype made its first flight on December 30, 1933.

It was followed by the second prototype, this being fitted with an American-built Cyclone and a three-bladed propeller, in January. Pilots found that the type was highly manoeuvrable but early flight experience suggested that moving the controls too abruptly could result in a spin from which it was almost impossible to recover. It was therefore decided that aerobatics should be forbidden during the trials phase.

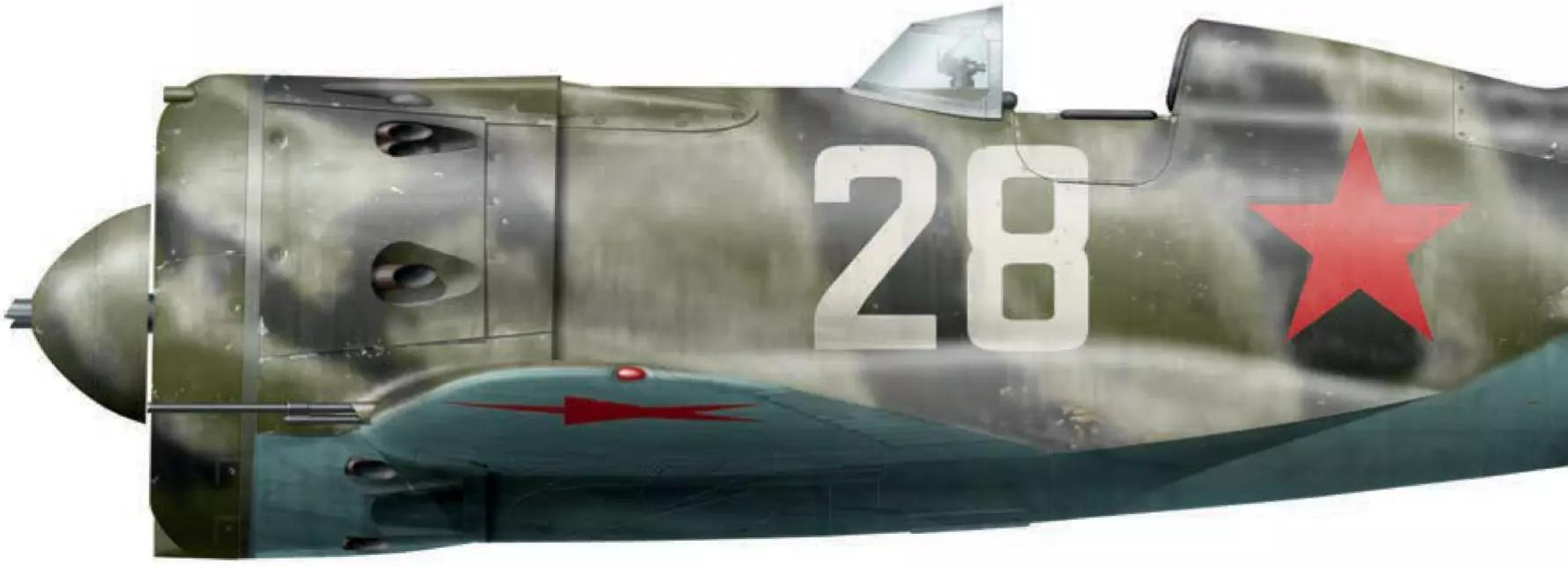
The tests also revealed that the more powerful Cyclone produced unwelcome vibrations, which resulted in pilot fatigue. Another complaint was how difficult it could be to climb into the very narrow cockpit aperture, and the manually cranked landing gear required a strong pilot – it was prone to jamming too.

During early 1934, an intensive programme of wind tunnel testing was undertaken to assess the type's tendency to spin and work out what preventative measures might be necessary. It was determined that the type's short fuselage could result in an unrecoverable flat

**PILOTS FOUND THE I-16 HIGHLY MANOEUVRABLE**

## POLIKARPOV I-16 ▼

**During the spring of 1942 Starshiy Leytenant Mikhail Vasiliyev, commander of the 1st Eskadrilya 4 GIAP/VVS-KBF, flew this aircraft in the Leningrad area while based at Lake Ladoga, USSR. He achieved six victories in air combat plus 16 shared. He was made a Hero of the Soviet Union on June 14, 1942, but was shot down and killed on May 5, 1943.**



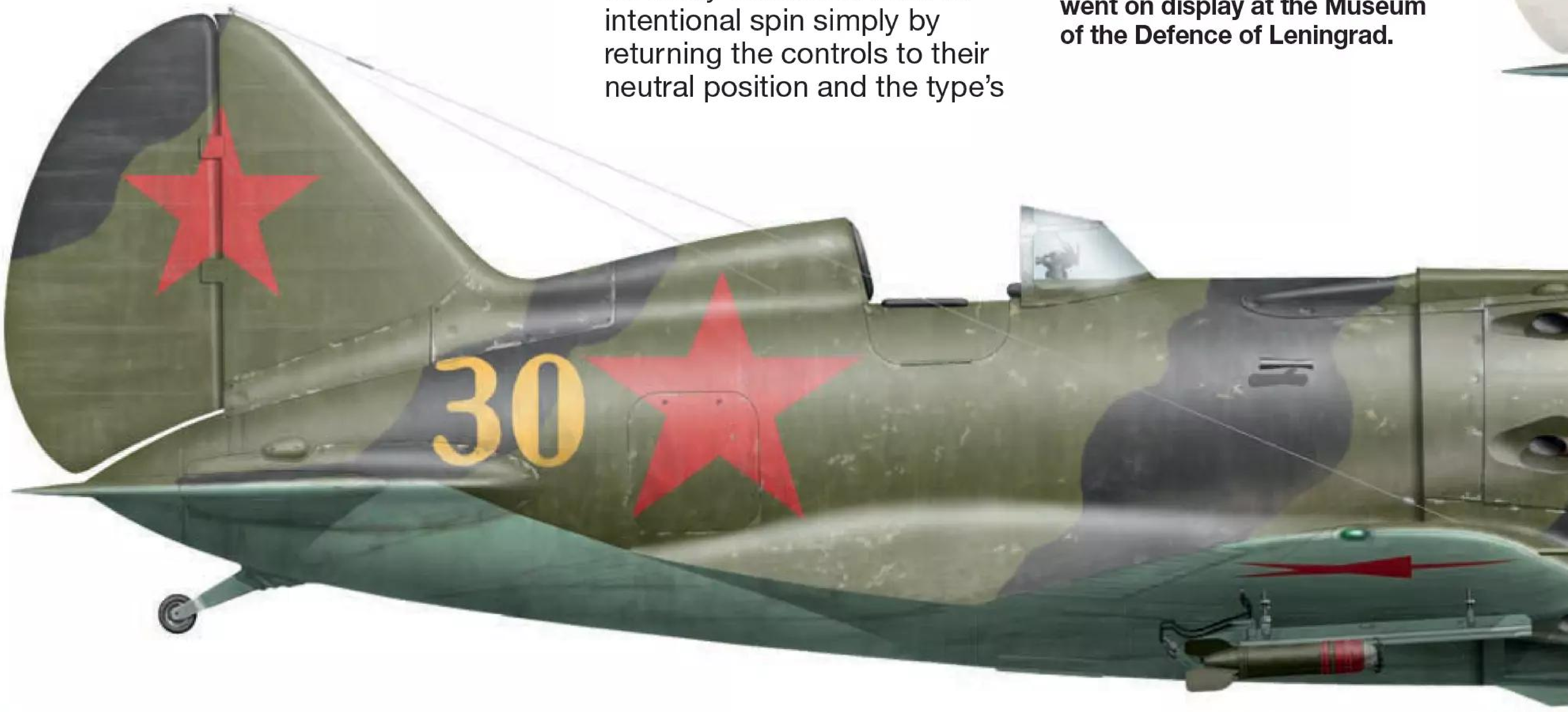
spin in certain conditions but this was impossible to prove conclusively – flight testing was the only way to proceed.

Since the Cyclone fitted to the second prototype was far rarer and more valuable than the M-22, it was decided that the first prototype should be used, and if necessary sacrificed, to continue the programme of spin testing.

Between March 1 and March 2, 1934, test pilot Valery Chkalov induced 75 spins and found that the much-feared flat spin simply never occurred. In reality, the TsKB-12 could be easily recovered from an intentional spin simply by returning the controls to their neutral position and the type's

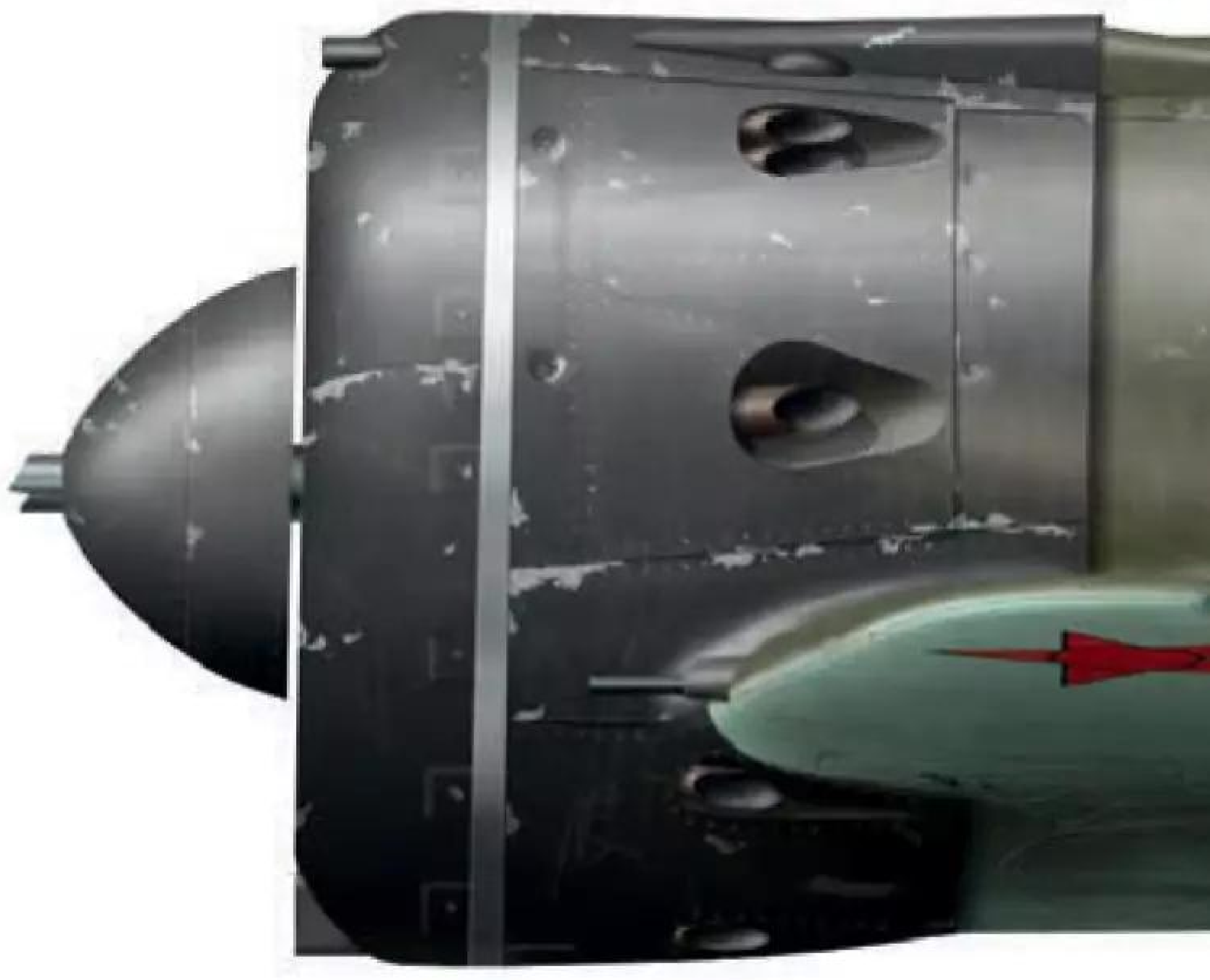
## POLIKARPOV I-16 ►

**The famous 'White 16' flown by Starshiy Leytenant Anatoliy G Lomakin of the 21 IAP/KBF. Lomakin was heavily involved in the defence of Leningrad during the summer of 1942 and flew 452 combat sorties in total, with seven victories in air combat plus 19 shared. 'White 16' later went on display at the Museum of the Defence of Leningrad.**



## POLIKARPOV I-16 ►

**This I-16 Mark 10 was flown by Leytenant A Brazovets of the 7th IAP on the Finnish Front during the Winter War of 1939. The Soviet Union invaded Finland on November 28, 1939, but suffered heavy losses due to the determined Finnish defence. Eventually, however, Finland was forced to accept territorial losses in the Moscow Peace Treaty of March 1940. 'Yellow 4' is unusual in having the 'circle type' Soviet star and also in having its number on its fin, rather than the rudder.**



stall behaviour was far more benign than expected.

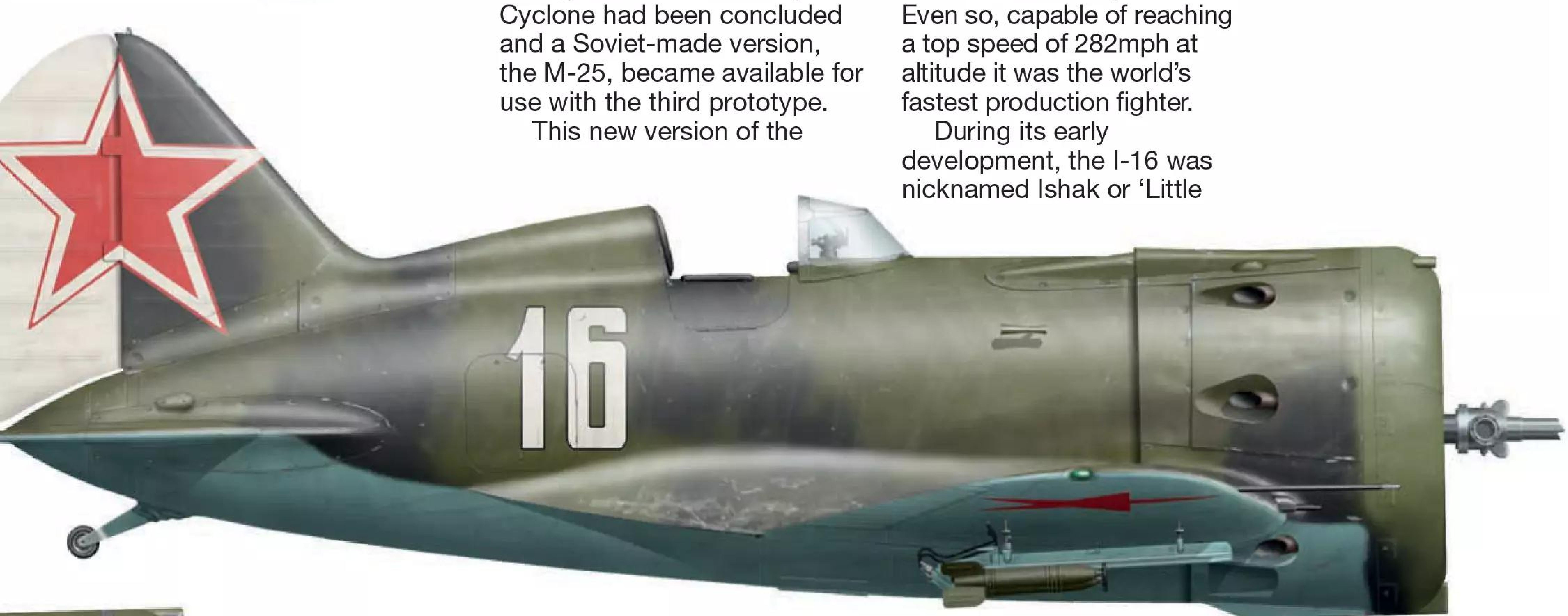
With safety concerns now allayed, the TsKB-12 was redesignated I-16 and service trials began on March 22, 1934. With its relatively puny M-22 engine, the first prototype could reach a top speed of 223mph – the same as the Hawker Fury then in service with the RAF.

By now some 30 production examples of the I-16 had been made with the M-22 installed, but these were not delivered to Soviet Air Force units. In the meantime, licensing arrangements for the Wright Cyclone had been concluded and a Soviet-made version, the M-25, became available for use with the third prototype.

This new version of the design incorporated a number of improvements including a slightly smaller engine cowling with nine shuttered openings to control the flow of cool air into the unit and an exhaust that was redesigned to have eight individual outlet stubs. Government tests, which commenced on September 7, 1934, determined that it had a top speed of 270mph.

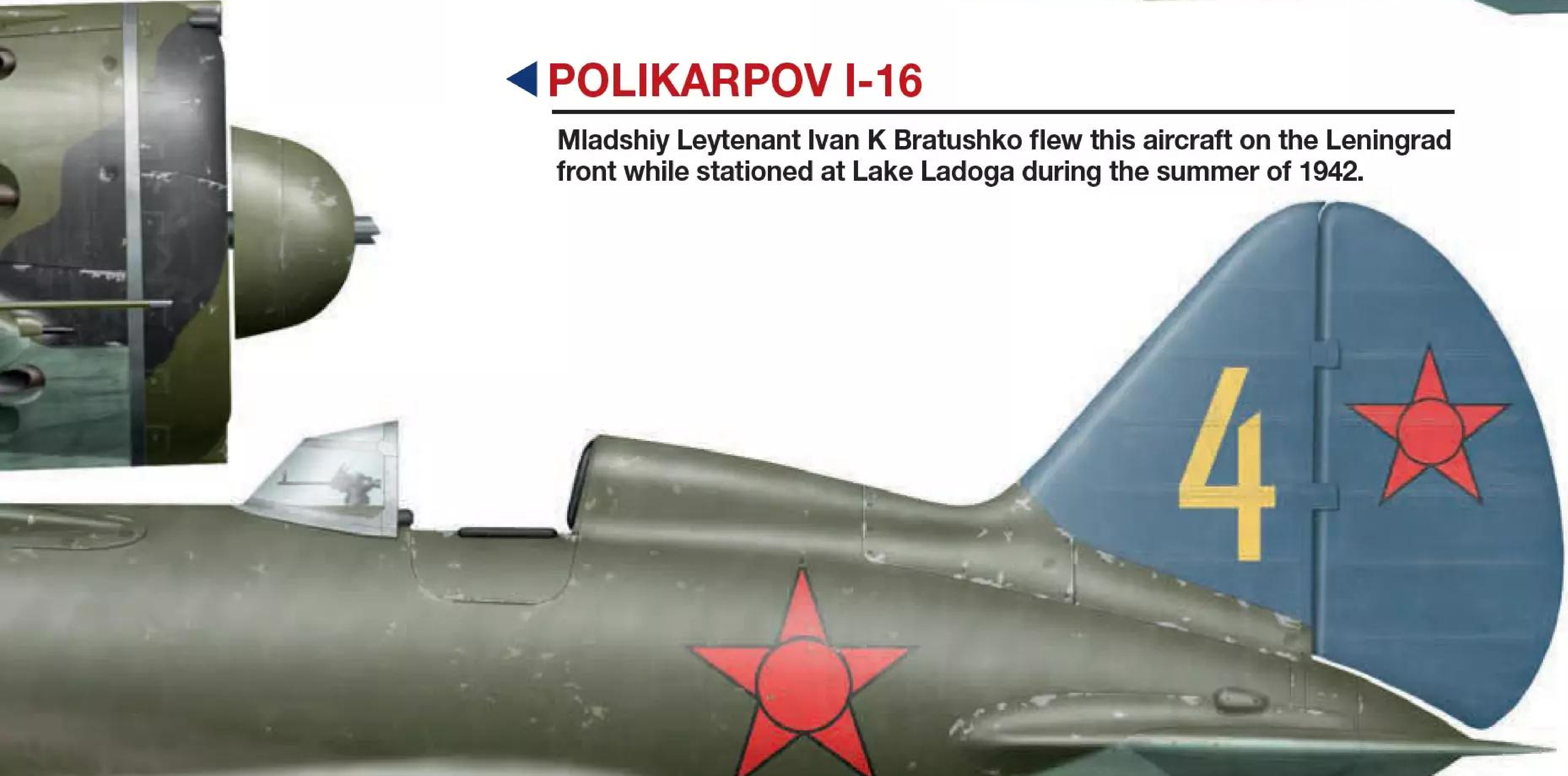
The production version fitted with the M-25, known as the I-16 Type 5, usually had low grade canopy glazing installed – which meant pilots often flew with it open or even had the rear section entirely removed. Even so, capable of reaching a top speed of 282mph at altitude it was the world's fastest production fighter.

During its early development, the I-16 was nicknamed Ishak or 'Little



## POLIKARPOV I-16

**Mladshiy Leytenant Ivan K Bratushko flew this aircraft on the Leningrad front while stationed at Lake Ladoga during the summer of 1942.**



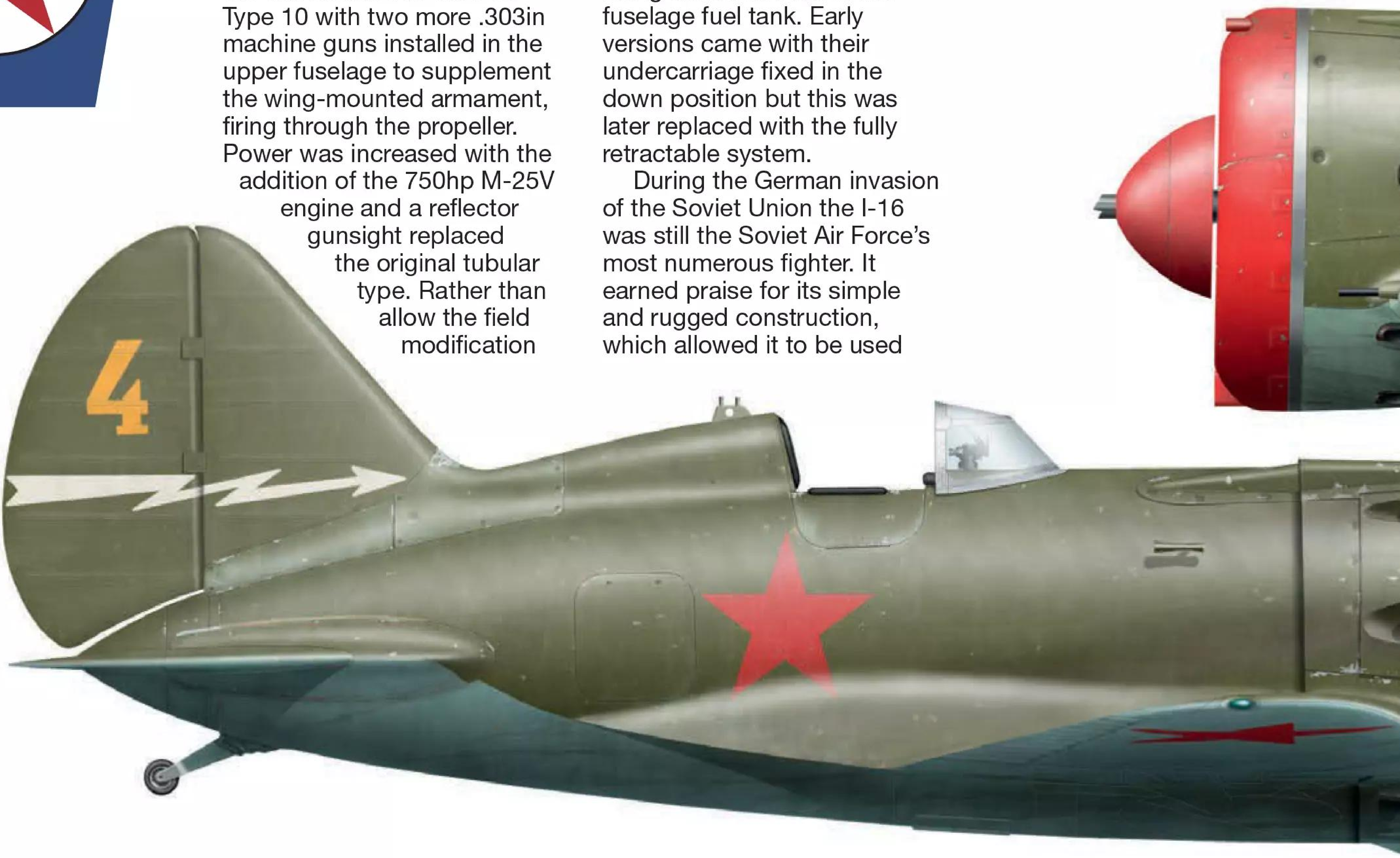
REPUBLICAN FORCES NICKNAMED THE I-16 MOSCA OR 'FLY'

Donkey' but when it entered service with the Republican forces during the Spanish Civil War it was nicknamed Mosca or 'Fly'. The Nationalist enemy gave it their own nickname however – Rata or 'Rat'.

Combat experience during the war resulted in the I-16 Type 10 with two more .303in machine guns installed in the upper fuselage to supplement the wing-mounted armament, firing through the propeller. Power was increased with the addition of the 750hp M-25V engine and a reflector gunsight replaced the original tubular type. Rather than allow the field modification of canopies to continue, the aircraft was now factory fitted with an open canopy and a fixed windscreen.

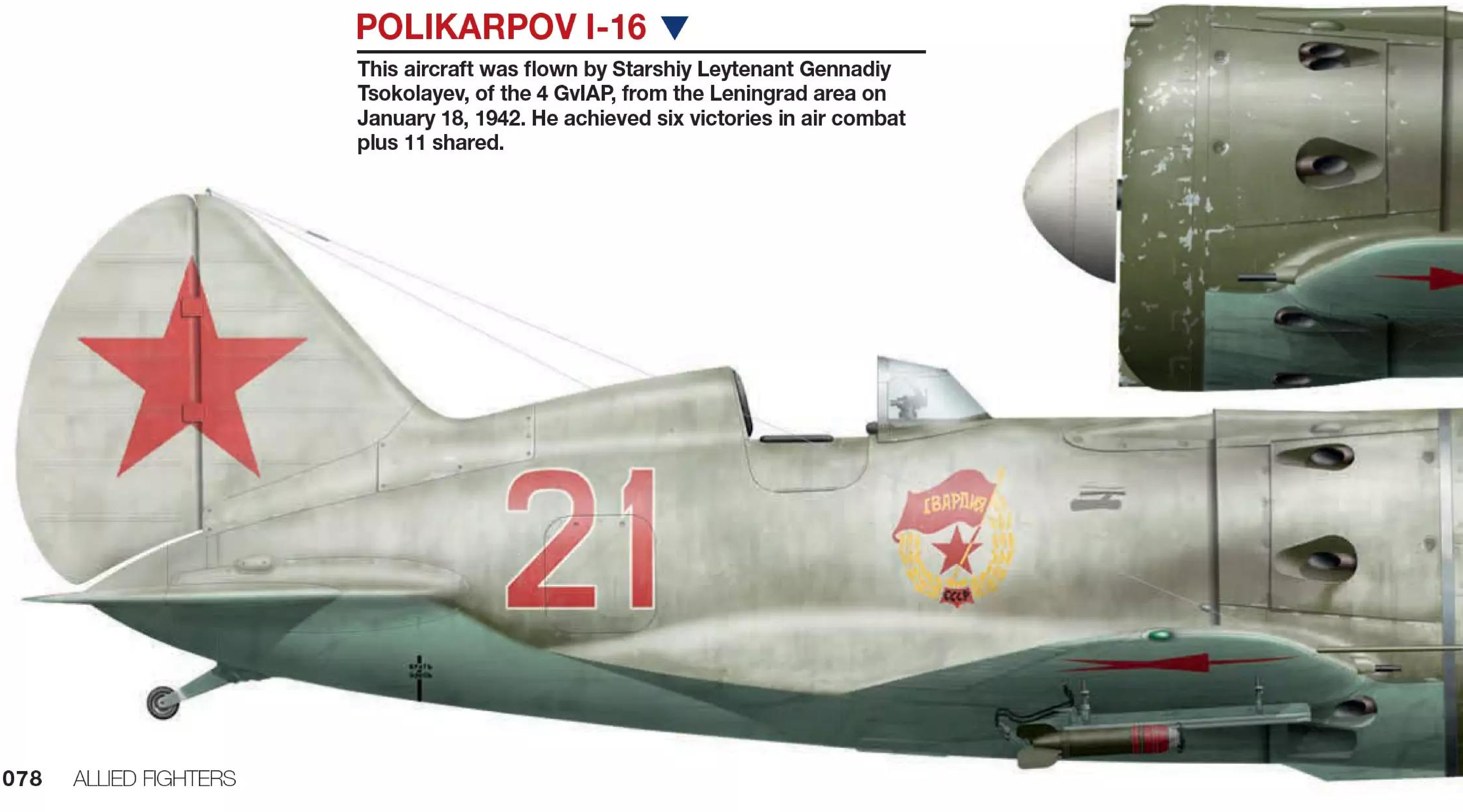
A two-seat trainer version, the UTI-4 or I-16 UTI, was developed in parallel with the Type 10 – a second cockpit being added in front of the fuselage fuel tank. Early versions came with their undercarriage fixed in the down position but this was later replaced with the fully retractable system.

During the German invasion of the Soviet Union the I-16 was still the Soviet Air Force's most numerous fighter. It earned praise for its simple and rugged construction, which allowed it to be used



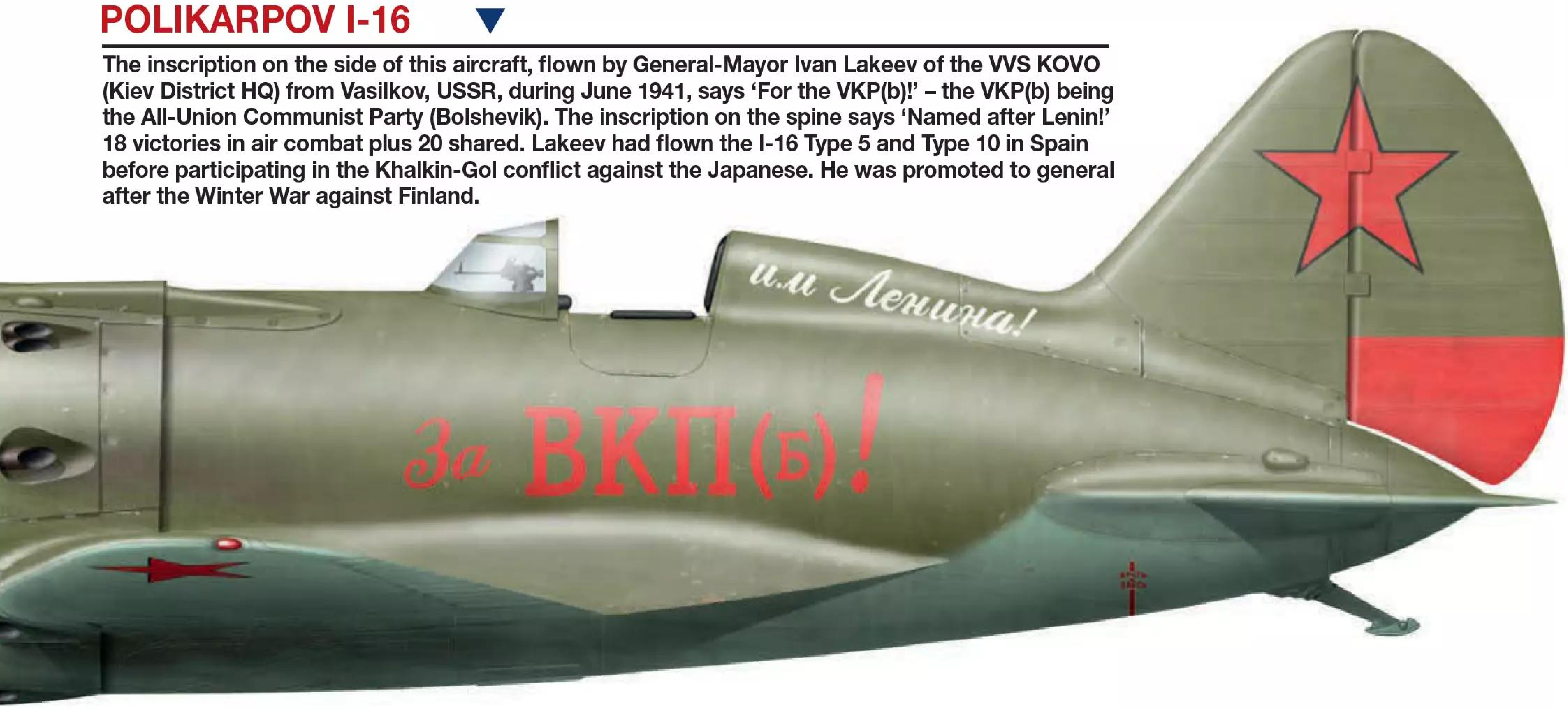
### POLIKARPOV I-16 ▼

**This aircraft was flown by Starshiy Leytenant Gennadiy Tsokolayev, of the 4 GvIAP, from the Leningrad area on January 18, 1942. He achieved six victories in air combat plus 11 shared.**



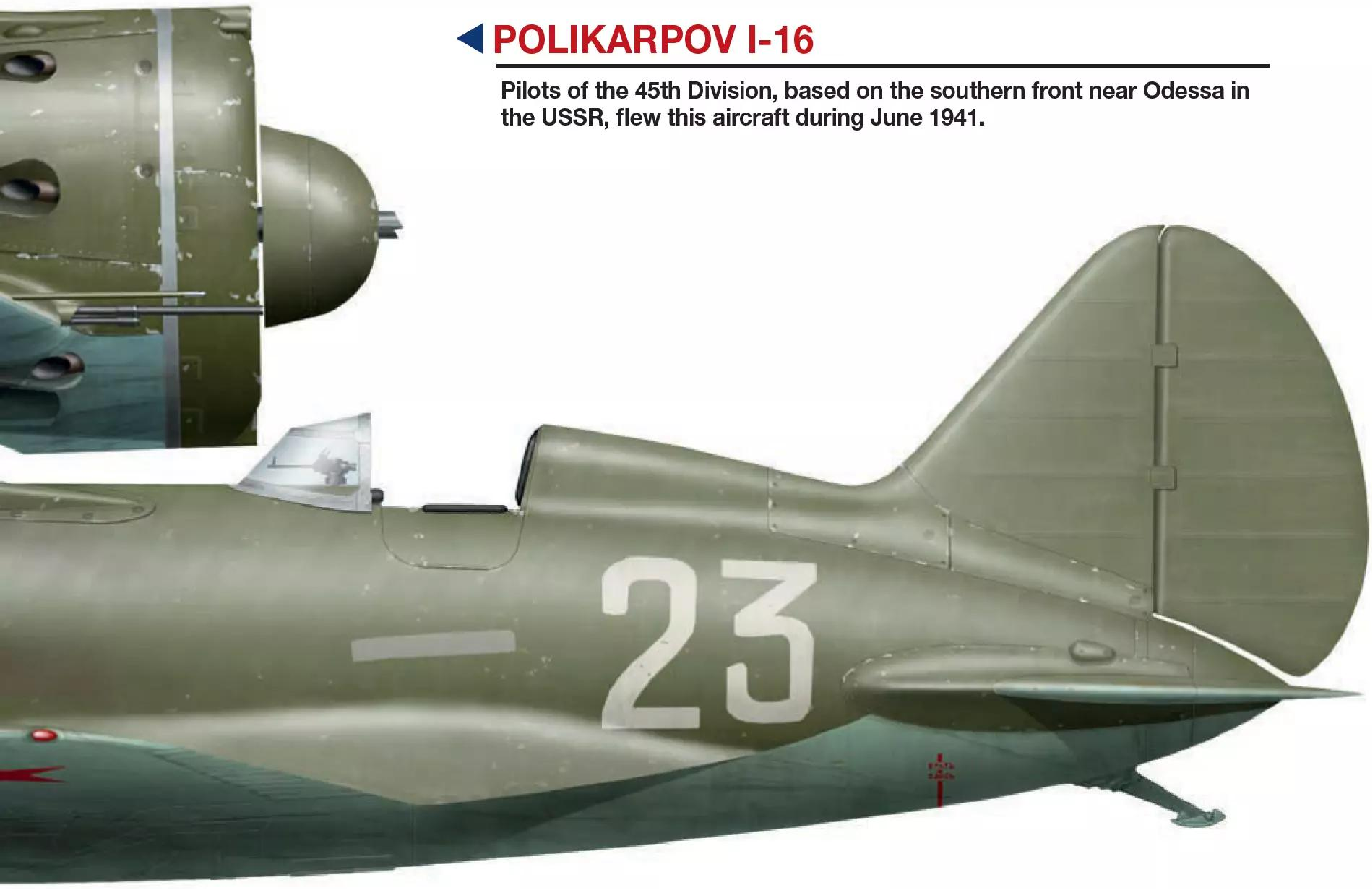
## POLIKARPOV I-16 ▼

**The inscription on the side of this aircraft, flown by General-Mayor Ivan Lakeev of the VVS KOVO (Kiev District HQ) from Vasilkov, USSR, during June 1941, says 'For the VKP(b)!' – the VKP(b) being the All-Union Communist Party (Bolshevik). The inscription on the spine says 'Named after Lenin!' 18 victories in air combat plus 20 shared. Lakeev had flown the I-16 Type 5 and Type 10 in Spain before participating in the Khalkin-Gol conflict against the Japanese. He was promoted to general after the Winter War against Finland.**


им Ленина!
За ВКП(б)!

## ◀ POLIKARPOV I-16

**Pilots of the 45th Division, based on the southern front near Odessa in the USSR, flew this aircraft during June 1941.**



## POLIKARPOV I-16 ▲

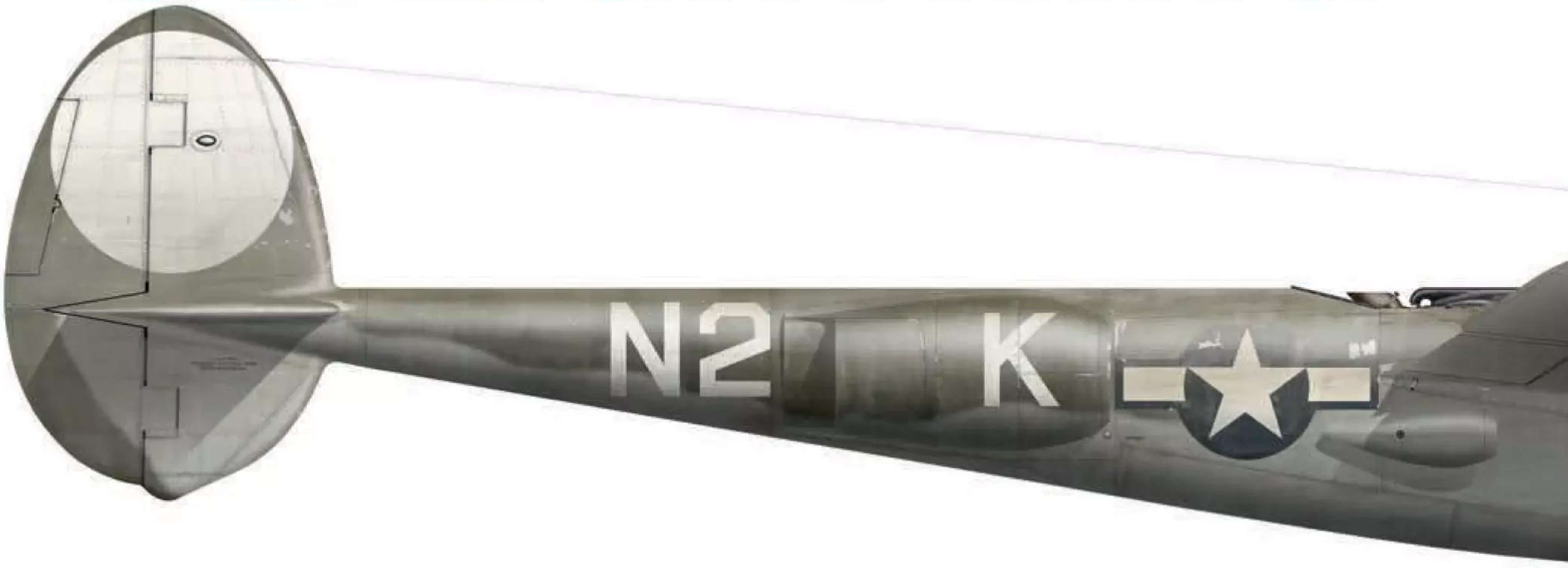
**More famous for flying LaGG-3s, this I-16 was flown by Leytenant Leonid A Galchenko of the 145th IAP, based at Shogui, Mongolia, during September 1939. He achieved seven victories in air combat overall, plus 23 shared.**

for ramming attacks against German aircraft when the pilot ran out of ammunition, but it was obsolete by 1941 and when set against the latest versions of the Messerschmitt Bf 109 in dogfighting combat it suffered badly.

It struggled on in service until 1943 and it is believed that some 8644 were built overall. ●

RUGGED CONSTRUCTION MEANT THE I-16 COULD SURVIVE RAMMING

# LOCKHEED P-38 LIGHTNING



**An unusual twin-boom design set the Lightning apart from the beginning but the type overcame early scepticism and teething problems to become one of the most powerful Allied fighters of the war.**

1939-1965

Lockheed and Vultee were among the companies that responded to a new US Army Air Corps requirement, Circular Proposal X-608, calling for a twin-engine high-altitude interceptor in 1937.

The aircraft was to carry at least 1000lb of weaponry, have a top speed of at least 360mph and climb to 20,000ft in less than six minutes powered by a pair of turbo-supercharged Allison V-1710 V12 engines. Lastly, it was to be fitted with a tricycle undercarriage.

The requirement was nearly the same as that which led to the Bell P-39 Airacobra, Circular Proposal X-609, except for the stipulation of two engines rather than one.

Vultee's proposal, the XP-1015, had a conventional single fuselage design with an Allison V-1710 V12 engine on each wing. It appeared solid and unremarkable.

Lockheed's Model 22 design, on the other hand, was radical. It had roughly the same dimensions as the XP-1015 and even a similar wing shape but that was where the similarities ended.

In coming up with the Model 22, Lockheed's engineers had studied a wide range of layouts, eventually settling on a twin-boom arrangement, with an engine on the forward end of each boom and a central nacelle housing both the pilot and the aircraft's main armament. This was planned to consist of

Journey's End

Texas Ranger

two .50 cal Browning machine guns, two .30 cal Brownings and a T1 Army Ordnance .90in autocannon with a rotary magazine.

The cockpit featured a bubble canopy, a tricycle undercarriage was fitted as specified, and the aircraft's structure was largely made from stainless steel covered with smooth flush-riveted aluminium skin panels.

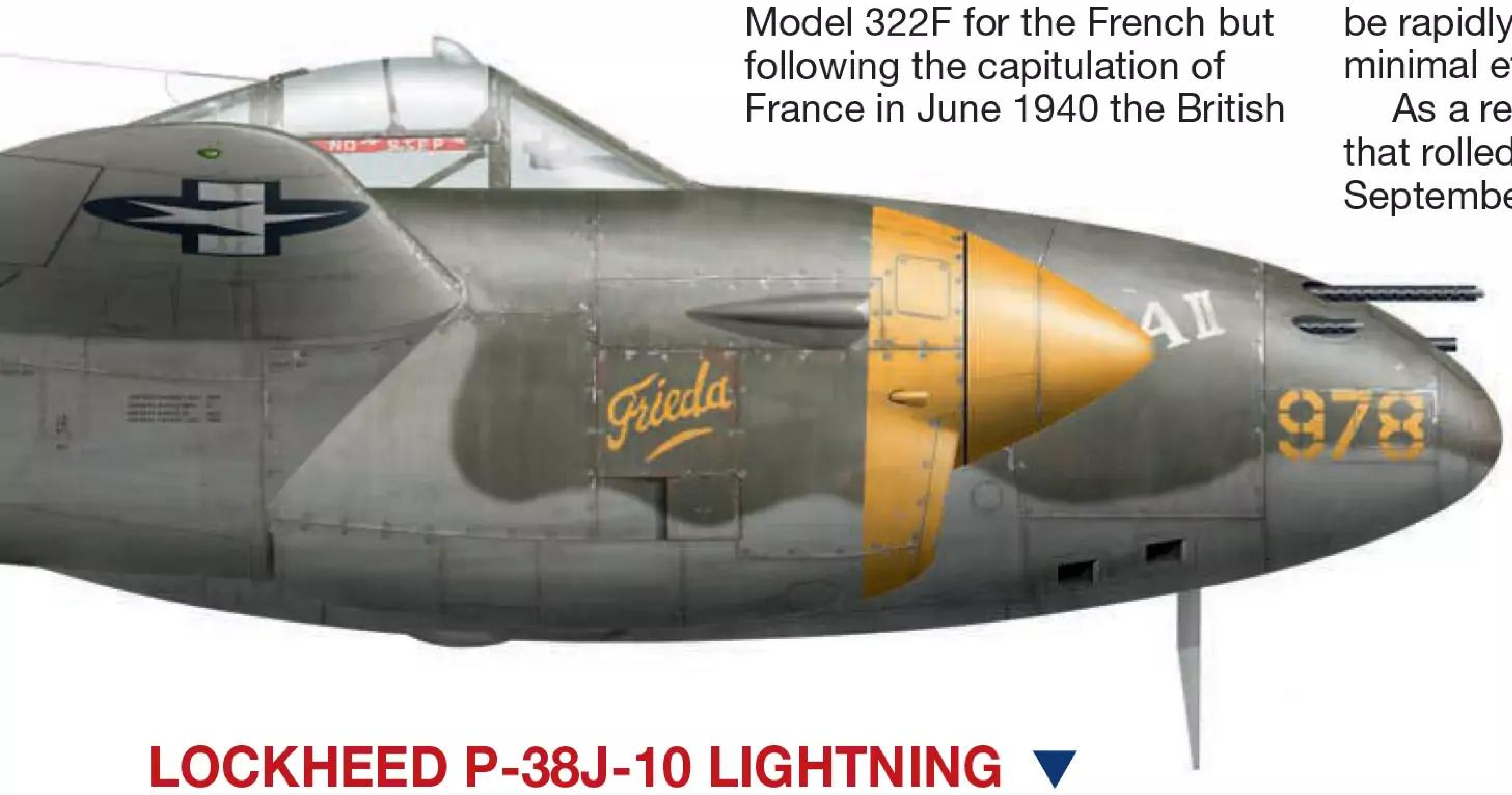
Despite, or perhaps because of, this unusual form Lockheed's fighter won the competition and the firm received a contract to construct a prototype under the designation XP-38. Work began in July 1938 and the XP-38 made its first flight on January 27, 1939.

Its performance was promising, though it was wrecked in a crash resulting from carburetor icing just over two weeks later, and the Army Air Corps placed an order for 13 YP-38s on April 27, 1939.

The joint Anglo-French Purchasing Commission ordered a total of 667 P-38s in March 1940. These were given the designations Model 322B for the British and Model 322F for the French but following the capitulation of France in June 1940 the British took up the whole order and decided that the type should be named Lightning in RAF service, rather than the name that Lockheed had given it – Atalanta, after a fierce virgin huntress from Greek mythology.

Work on building the YP-38s was slower than expected at Lockheed due to the massive growth that the company was experiencing, and the difficulties it encountered in translating the hand-finished one-off XP-38 prototype into a mass production model that could be rapidly assembled with minimal effort.

As a result, the first YP-38 that rolled off the line in early September 1940 differed

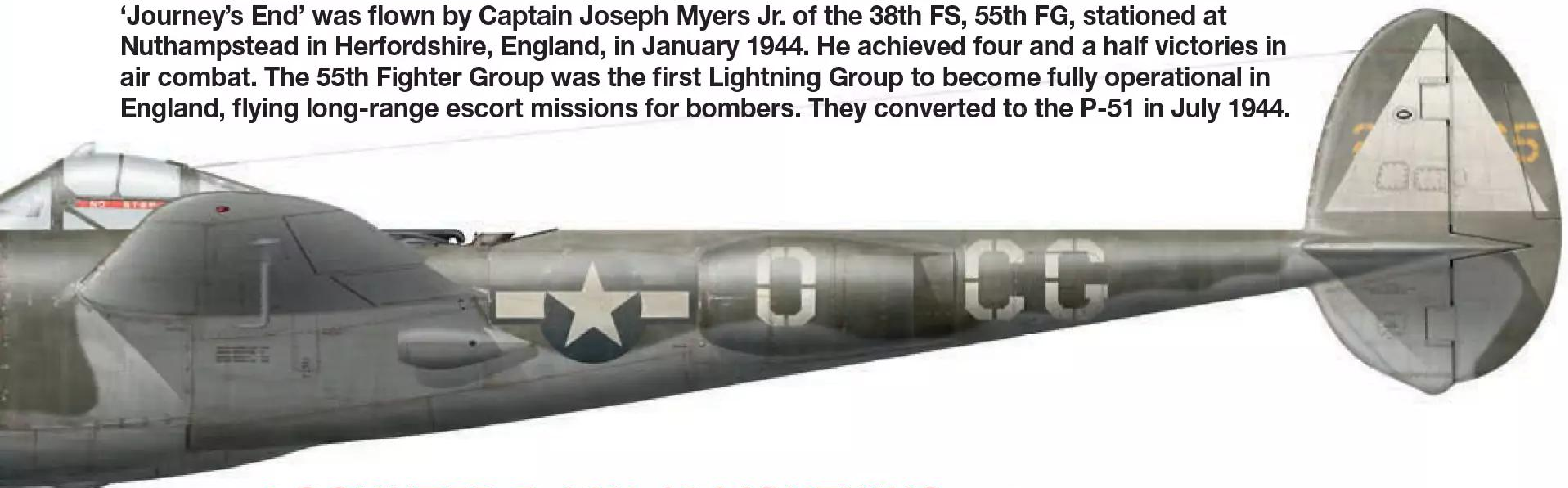


### LOCKHEED P-38J-10 LIGHTNING ◄

**Lieutenant Loren R Wilson of the 383rd FS, 364th FG, flew 'Betty A II' out of Honington, England, during May 1944.**

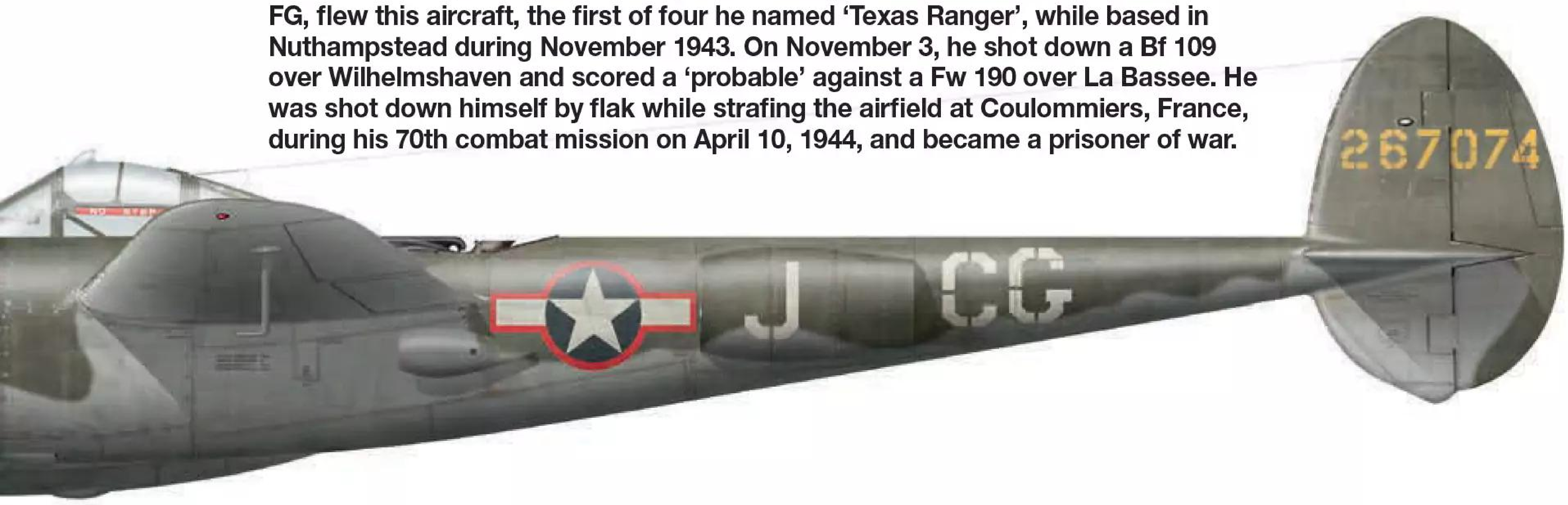
### LOCKHEED P-38J-10 LIGHTNING ▼

**'Journey's End' was flown by Captain Joseph Myers Jr. of the 38th FS, 55th FG, stationed at Nuthampstead in Herfordshire, England, in January 1944. He achieved four and a half victories in air combat. The 55th Fighter Group was the first Lightning Group to become fully operational in England, flying long-range escort missions for bombers. They converted to the P-51 in July 1944.**

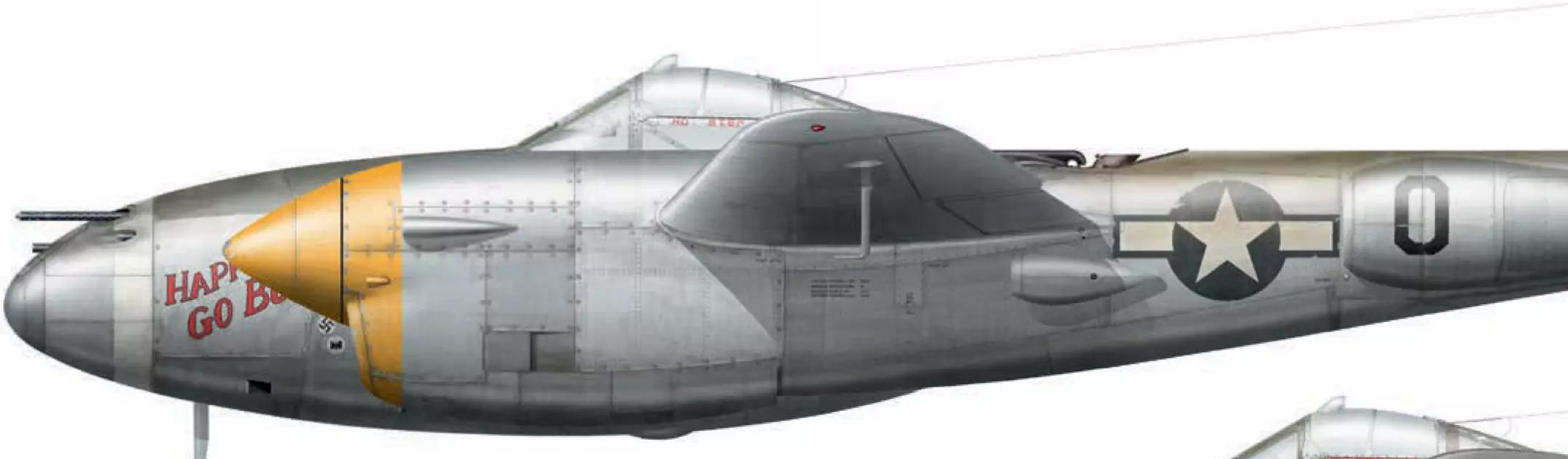


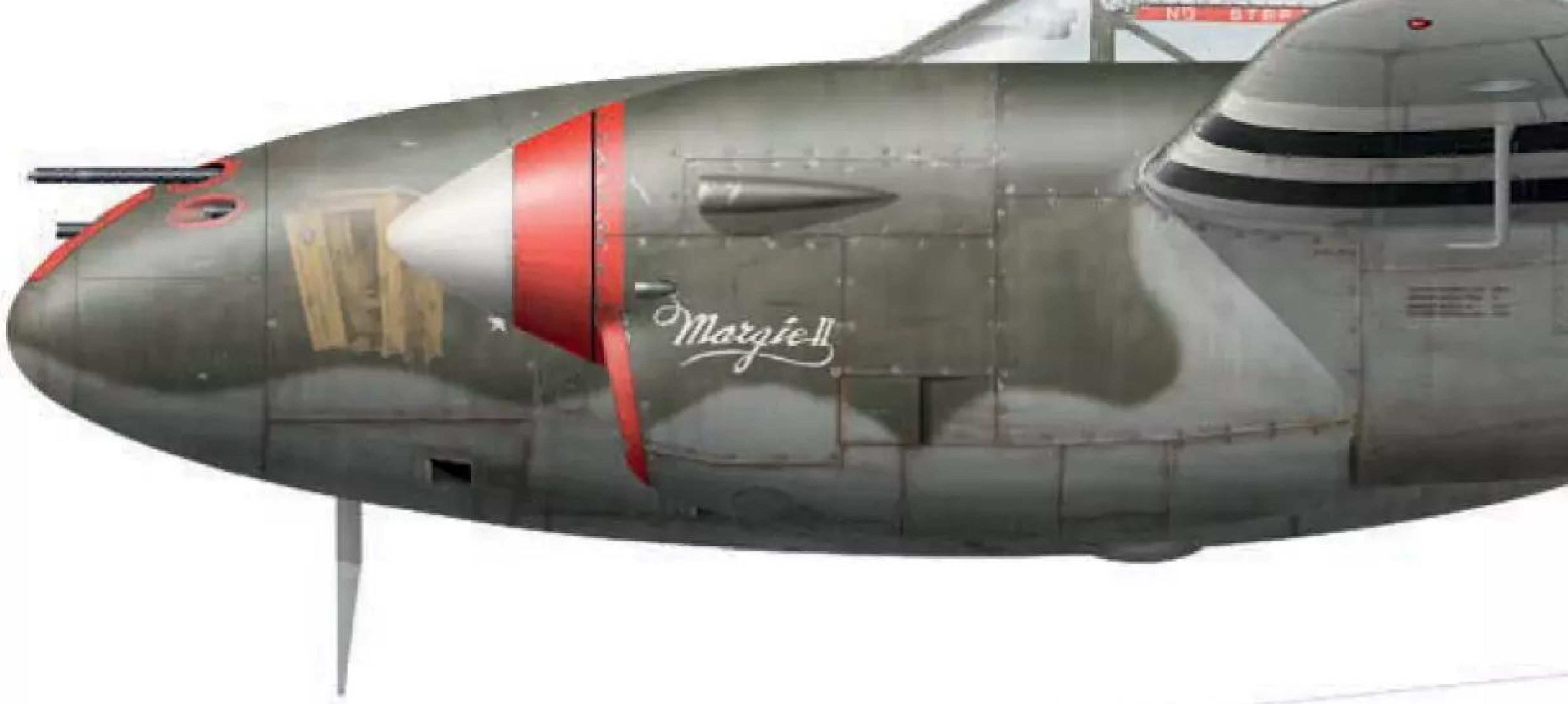
### LOCKHEED P-38H-10 LIGHTNING ▼

**Texas-born Major Jack S Jenkins, commanding officer of the 38th FS, 55th FG, flew this aircraft, the first of four he named 'Texas Ranger', while based in Nuthampstead during November 1943. On November 3, he shot down a Bf 109 over Wilhelmshaven and scored a 'probable' against a Fw 190 over La Bassee. He was shot down himself by flak while strafing the airfield at Coulommiers, France, during his 70th combat mission on April 10, 1944, and became a prisoner of war.**



LIGHTNINGS ORDERED BY THE FRENCH WERE DELIVERED TO THE BRITISH INSTEAD



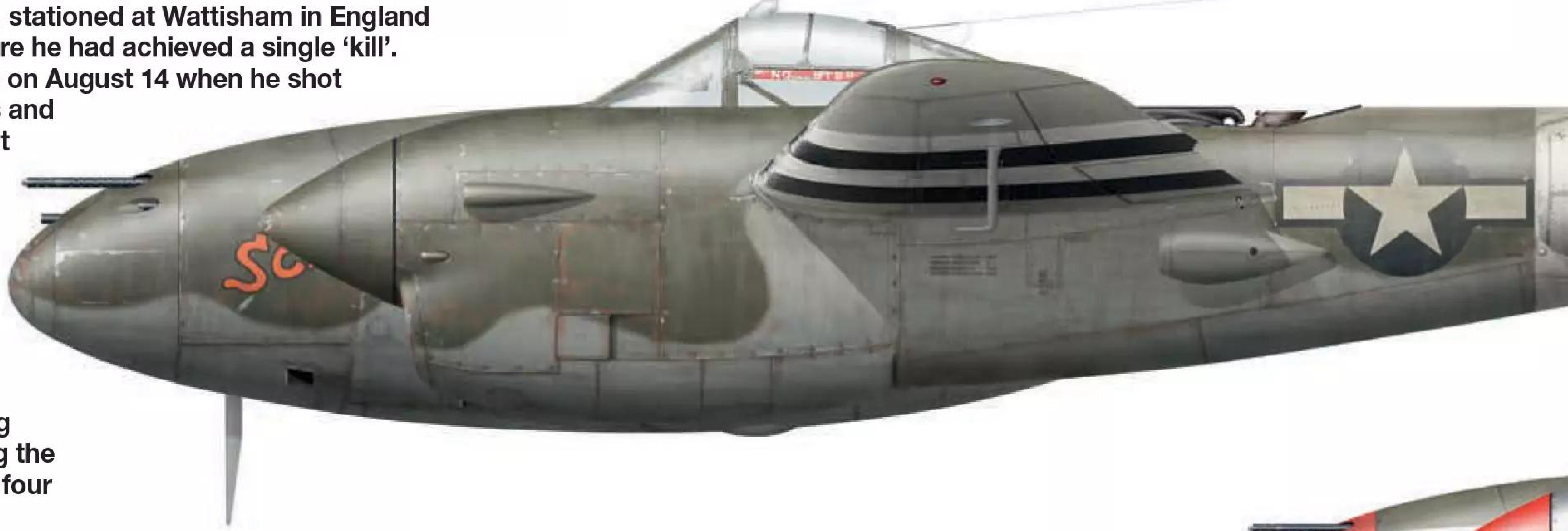


## LOCKHEED P-38J LIGHTNING ▶

**Major James T 'Jim' Tucker, commanding officer of the 402nd FS, 370th FG, based at Andover in England, flew this Lightning during June 1944. The logo on the nose depicts an outhouse being struck by lightning. Tucker was killed in action on a mission to Chateaudun on August 10, 1944.**

## LOCKHEED P-38J-15 LIGHTNING ▼

**This aircraft, Scat II, was flown by Captain Robin Olds of the 434th FS, 479th FG, stationed at Wattisham in England during July 1944 – before he had achieved a single 'kill'. His first victories came on August 14 when he shot down a pair of Fw 190s and overall he claimed eight victories while flying the Lightning and was credited as the top-scoring P-38 ace of the European theatre. He later converted to P-51s and ended the war with 12 aerial combat victories. Flying the F-4 Phantom during the Vietnam War he added four more to his tally.**

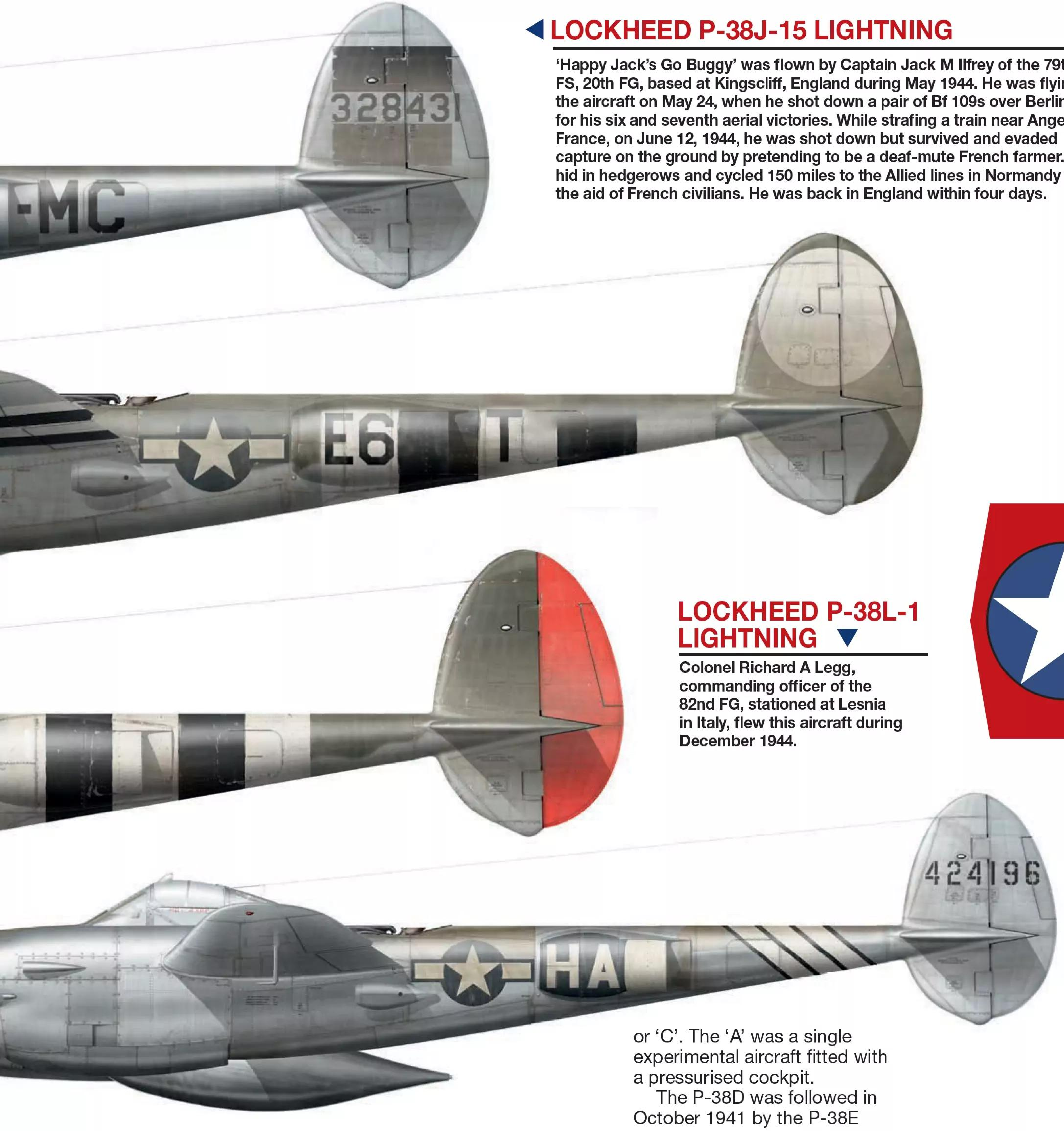


EARLY LIGHTNINGS SUFFERED SEVERE VIBRATIONS WHEN DIVING

somewhat from the original – being lighter and having different engine mountings. In addition, the propellers span the opposite way round. On the XP-38, they span inwards towards the cockpit – the left one spinning to the right, and the right one spinning to the left. On the YP-38, they span outwards, each turning away from the cockpit.

This aircraft made its first flight on September 17, 1940, but the 13th and last example was not ready to fly until June 1941. Testing revealed that when the aircraft reached a flight speed approaching Mach 0.68 during a dive, it began to shake uncontrollably and the controls would lock up. This was recoverable at low altitude if the pilot stayed with the aircraft but it was more likely that they would bail out rather than take the chance.

In spite of this known problem, the aircraft was rushed into full production to meet the demands of Lockheed's increasingly impatient customers. Following combat experience with other types during the Battle of Britain, the British realised that the Lightnings they had ordered during the war's first few months would be outdated and unfit for combat by the time they were delivered and on August 5, 1941, they attempted to have the contract amended so that only 143 aircraft would be built to the original specification, and the remaining 524 would be produced to the latest US spec as the Lightning Mk.II.



## LOCKHEED P-38J-15 LIGHTNING

**'Happy Jack's Go Buggy' was flown by Captain Jack M Ilfrey of the 79th FS, 20th FG, based at Kingscliff, England during May 1944. He was flying the aircraft on May 24, when he shot down a pair of Bf 109s over Berlin for his six and seventh aerial victories. While strafing a train near Angers, France, on June 12, 1944, he was shot down but survived and evaded capture on the ground by pretending to be a deaf-mute French farmer. He hid in hedgerows and cycled 150 miles to the Allied lines in Normandy with the aid of French civilians. He was back in England within four days.**

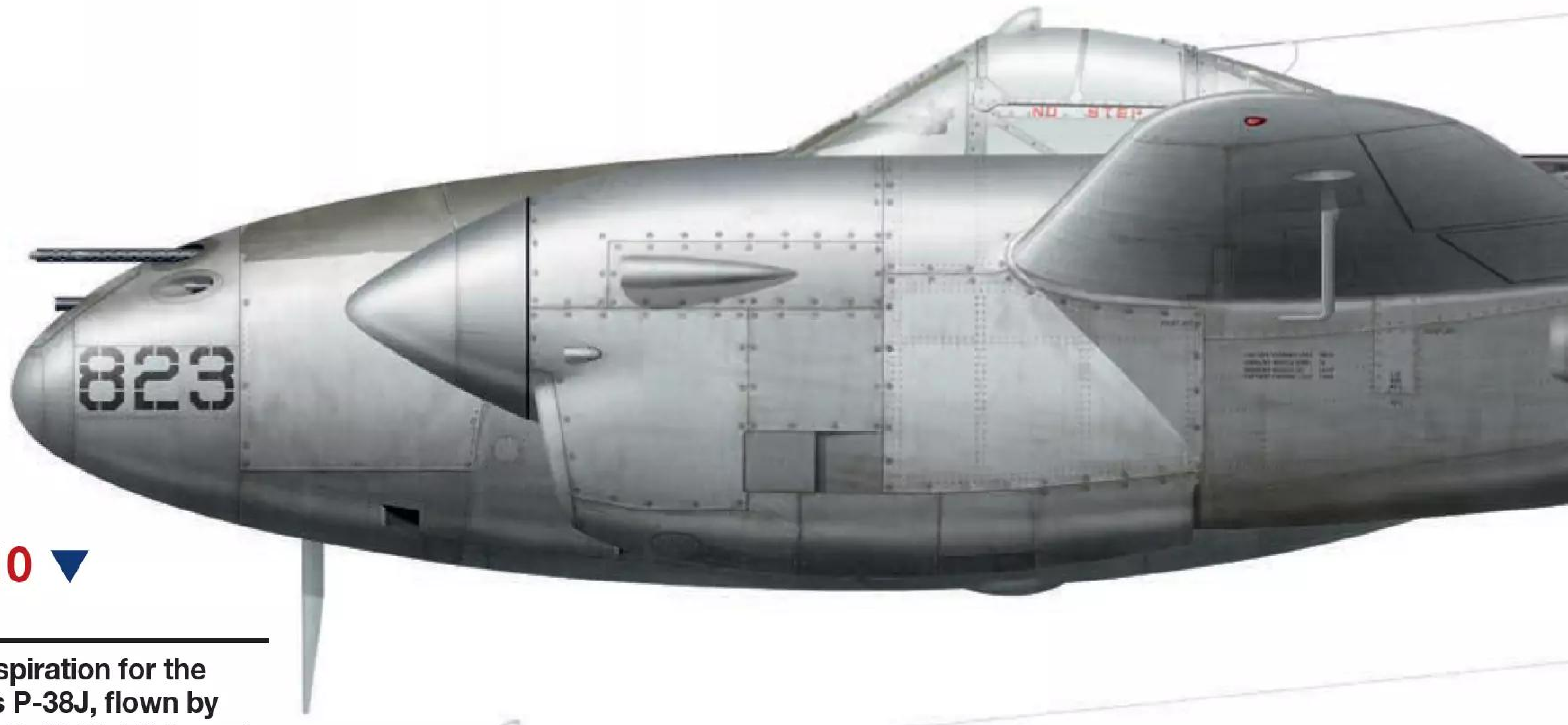
## LOCKHEED P-38L-1 LIGHTNING

**Colonel Richard A Legg, commanding officer of the 82nd FG, stationed at Lesnia in Italy, flew this aircraft during December 1944.**

A few weeks later an RAF test pilot encountered the same vibration problem that the Americans had experienced previously but not yet resolved and reported it to his superiors as 'tail flutter'. This caused the British to cancel all but three of the 143 Lightning Mk.Is – resulting in a loss of $15 million for Lockheed. The company then launched a legal challenge, trying to hold the British government to the terms of its original order.

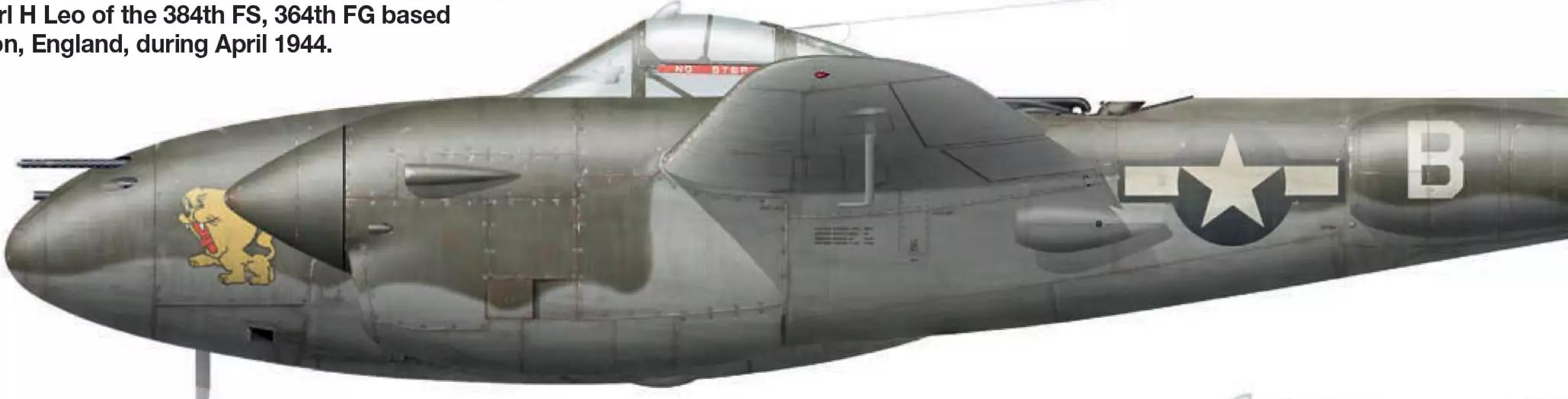
By September 1941 a total of 66 first run P-38Ds had been built for the newly renamed US Army Air Force. Armament was four .50 cal machine guns with a single .79in Hispano autocannon. The 'D' was the first production model Lightning, with no 'B' or 'C'. The 'A' was a single experimental aircraft fitted with a pressurised cockpit.

The P-38D was followed in October 1941 by the P-38E with upgraded electrical and hydraulic systems, plus improved instruments in the cockpit. New Curtiss propellers were added part-way through production and where the machine guns on the P-38D had been symmetrically arranged, those on the P-38E were staggered, with each barrel protruding by a different amount. This meant that there was more room for



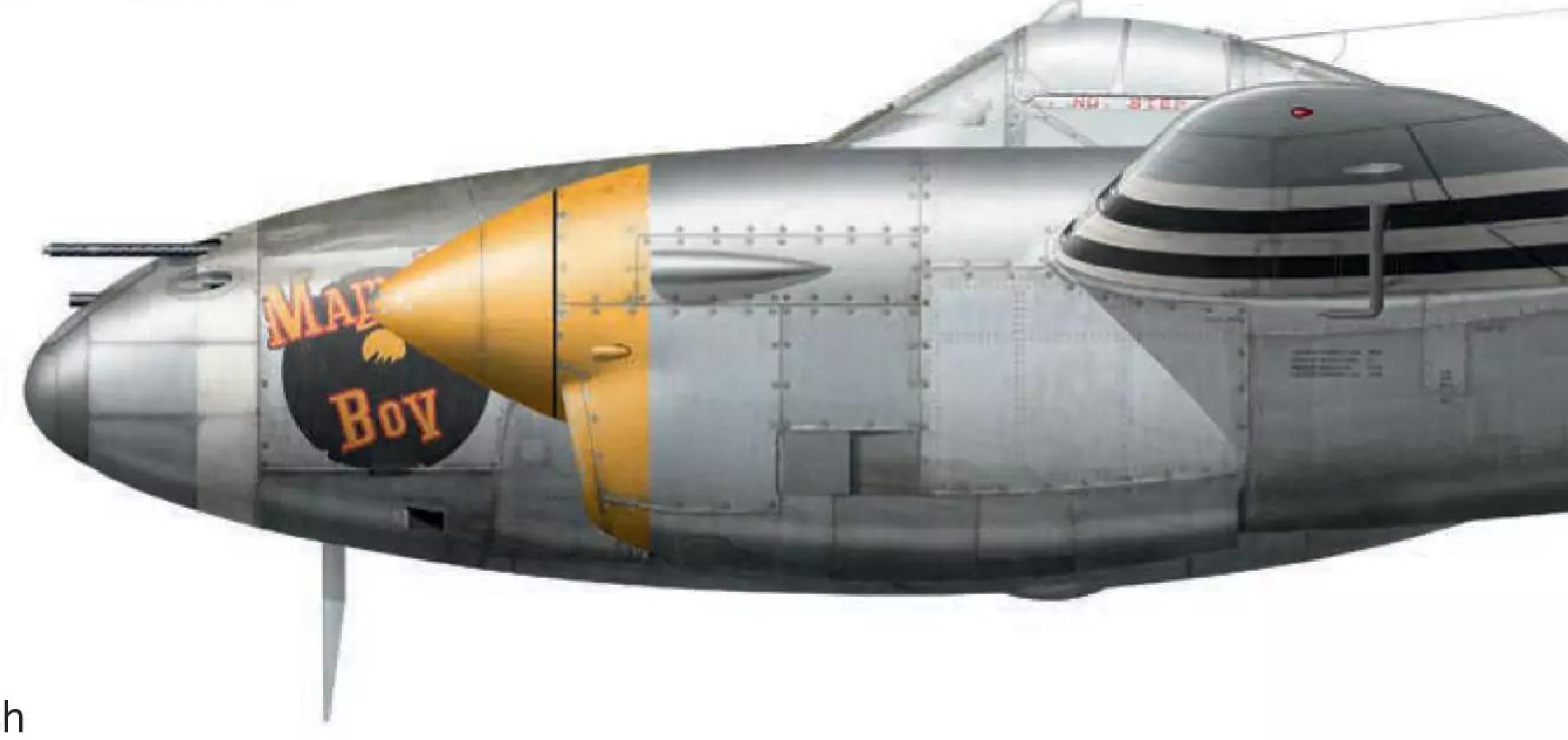
## LOCKHEED P-38J-10 ▼ LIGHTNING

**It is not difficult to discern the inspiration for the lion that adorned the nose of this P-38J, flown by Captain Carl H Leo of the 384th FS, 364th FG based at Honington, England, during April 1944.**



## LOCKHEED P-38J-15 ▶ LIGHTNING

**'Mama's Boy' was flown by Chicago-born Lieutenant Edwin E Wasil of the 55th FS, 20th FG, while he was stationed at Kingcliffe in England during June 1944.**

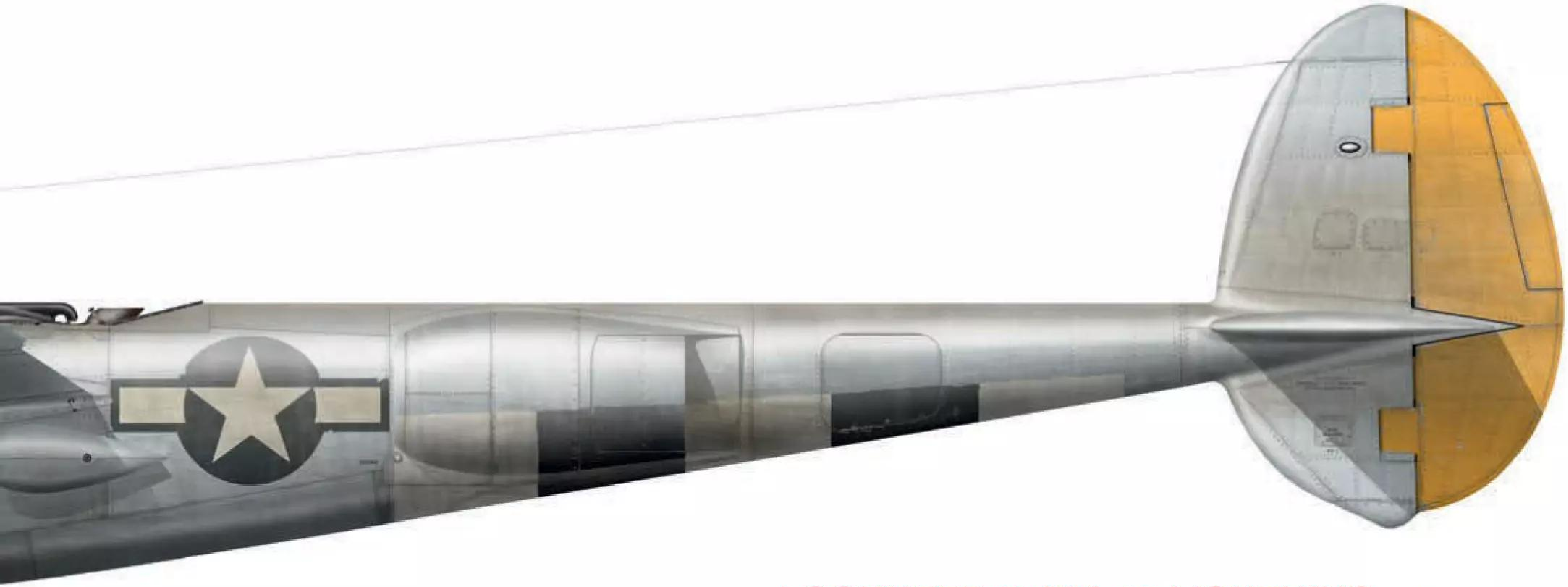


the ammunition feed of each weapon further back in the nose.

The attack on Pearl Harbor on December 7, 1941, resulted in the US government seizing all Lightnings bound for Britain and diverting them to the USAAF. In April 1942, the P-38E was replaced on production lines by the P-38F, which was fitted with racks inboard of the engines that could be used to carry drop tanks or up to 2000lb of bombs.

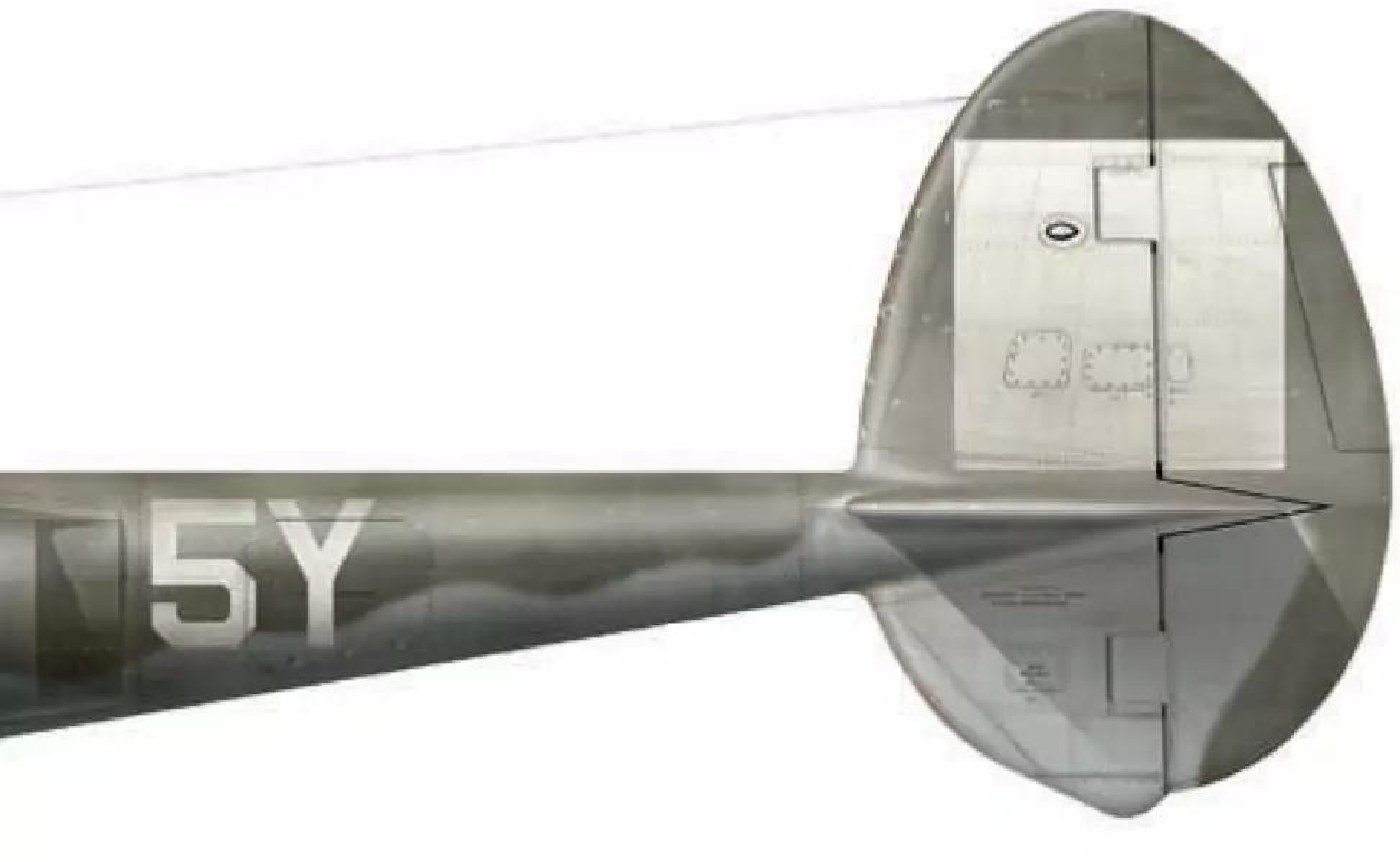
The 'F' was followed by the P-38G in early 1943. This had more powerful engines capable of 1400hp each and a better radio. The P-38H was a stopgap between the 'G' and the significantly redesigned P-38J. It featured an improved 20mm cannon and the ability to carry up to 3200lb of bombs. However, it also suffered from severe engine unreliability during operations in Europe due to a combination of the cold climate and the high altitudes at which it was expected to operate. This ultimately led to the Lightning being almost completely withdrawn from the European theatre by September 1944.

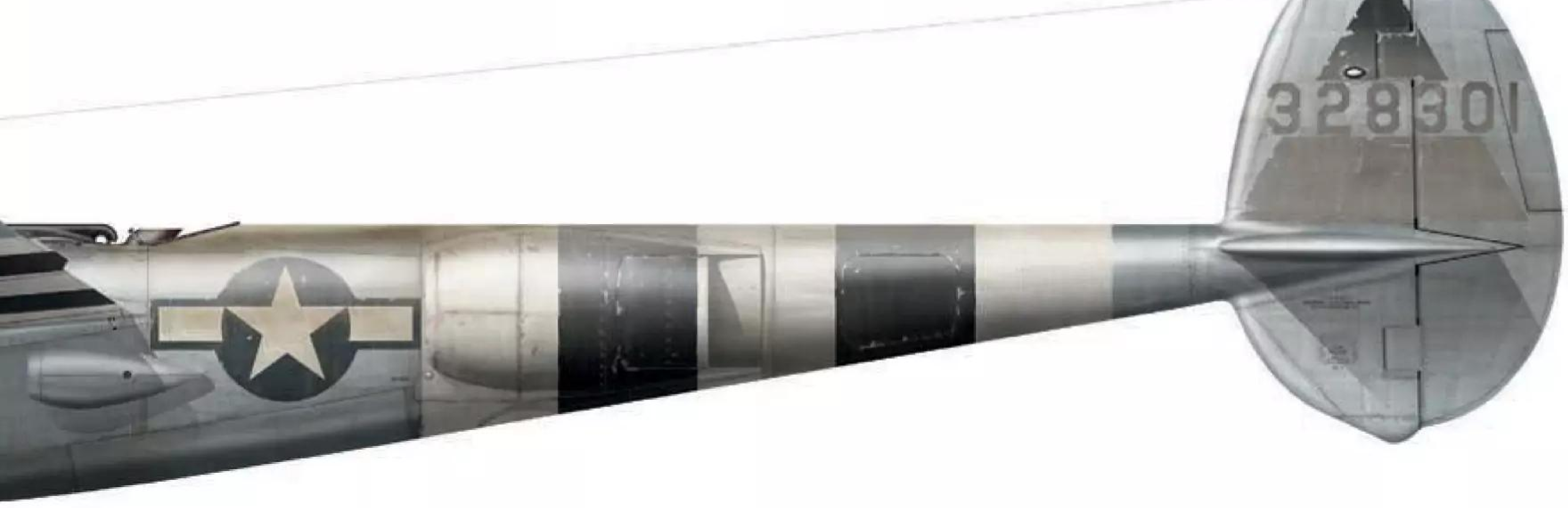
Introduced in August 1943, the P-38J had a new turbo-supercharger intercooler system fitted to the streamlined nacelles of its engines themselves – giving



## LOCKHEED P-38J-15 LIGHTNING ▲

**The commanding officer of the 479th FG based at Wattisham, England, Colonel Hubert Zemke, flew this aircraft during August 1944. Zemke had previously led the highly experienced 56th FG, which became known as 'Zemke's Wolfpack' and claimed more than 500 German aircraft shot down during the period when he was in charge. Shortly after he joined the inexperienced 479th, the unit converted to P-51s and Zemke made one of the first probable shoot-downs of a Me 262. During a mission on October 30, 1944, the wing of his Mustang was torn off by turbulence and he was captured on the ground after bailing out. He spent the rest of the war as a PoW.**





**THE P-38L WAS THE MOST PRODUCED VARIANT**

them a very visible 'chin'. This replaced the old system when had been positioned in the aircraft's wing leading edges and not only provided a power boost but also cured the engine problems which had plagued earlier Lightnings.

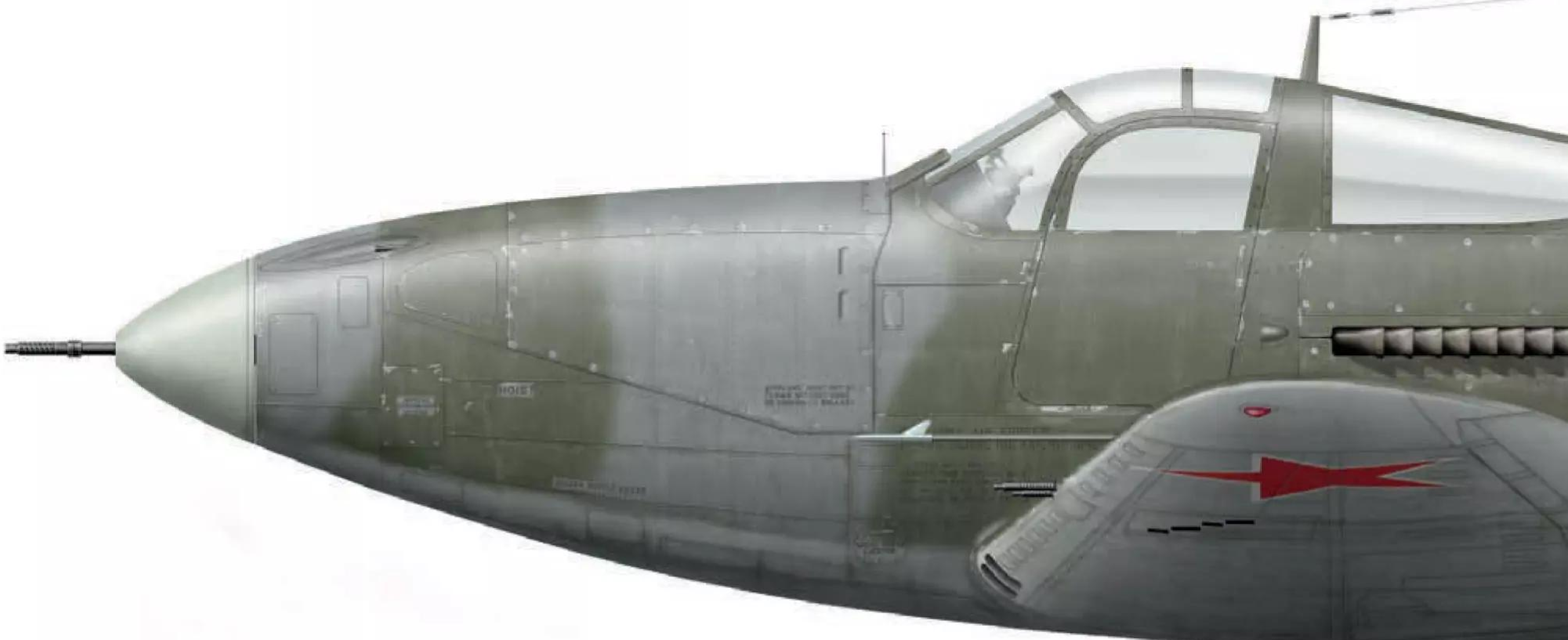
The 'J' also incorporated a feature which finally alleviated the Lightning's diving vibration problem. Electrically-actuated dive recovery flaps just outboard of the engines changed the geometry of the wing underside during a dive – providing more lift and preventing the vibrations. Hydraulically boosted ailerons were also introduced with the P-38J-25 which dramatically improved the aircraft's roll rate and made its controls lighter.

Only one P-38K was built and used for experimental engine tests. The P-38L on the other hand was the most produced version of the fighter. Its most common sub-variant, the P-38L-5 had an improved cockpit heating system and uprated Allison V-1710-112/113 engines.

While most late-model P-38s were delivered unpainted, since the aircraft's extremely smooth metal outer skin offered a small performance advantage, 75 P-38Ls were modified to become night fighters as the P-38M. These were painted matt black and had cone-shaped flash-hiders on their guns plus an AN/APS-6 radar pod positioned beneath the nose. Perhaps the biggest change, though, was the addition of a second cockpit behind the pilot for a radar operator.

A total of 10,037 Lightnings were built all together. •

# BELL P-39 / P-400 AIRACOBRA



**Design compromises limited its performance from the outset but nevertheless the P-39 Airacobra was heavily armed and saw front-line service with Allied forces around the world.**

1938-1945

The need for a high-altitude interceptor was identified by the United States Army Air Corps towards the end of 1936 and in February 1937 a new specification was issued to manufacturers.

The new aircraft would need to be armed with cannon, feature a tricycle undercarriage and be powered by a liquid-cooled Allison engine with a General Electric turbo-supercharger. Level airspeed at altitude needed to be at least 360mph and the climb to 20,000ft had to be achieved in less than six minutes.

Bell had relatively little experience in fighter design but still managed to come up with an innovative configuration, designated Model 12, which appeared to have a good chance of meeting the spec.

The Model 12's Allison V-1710 V12 engine was to be positioned centrally in the fuselage, with the propeller shaft passing under the pilot's feet and into a gearbox, which then drove the propeller. The gearbox was provided with its own lubrication system and later its own armour protection.

Directly beneath the engine, in the wing centre section, was its radiator and on either side was an oil cooler. On the upper side of the fuselage, immediately aft of the cockpit, was an oval air intake for the engine's carburetor.

This engine arrangement allowed sufficient space to be freed up in the nose for the powerful but temperamental 1.46in Oldsmobile T9 cannon to be fitted, firing through the centre of the propeller.

Having a centrally positioned main armament allowed for greater accuracy and stability during combat, even though the amount of ammunition that could be carried was severely limited.

Moving the engine away from the nose also improved the aircraft's aerodynamic profile, allowing the Model 12's projected performance to edge closer to the specification's ambitious requirements. A further aerodynamic improvement was the lack of a sliding cockpit canopy, with the pilot entering through one of the two side doors instead. Only the right hand door had an internal handle however, so this was the usual way of entering and leaving the cockpit.

Bell was given the go-ahead to proceed with prototype construction and the XP-39 made its first flight on April 6, 1938, at Wright Field in Ohio. It managed to reach 20,000ft in just five minutes and reportedly achieved a top speed of 390mph, albeit without weapons, armour or self-sealing fuel tanks – which would make it the fastest landplane in the world at that point.

The key to this stunning performance was the engine's turbo-supercharger, which was fed cooling air by a scoop on the left side of the fuselage.

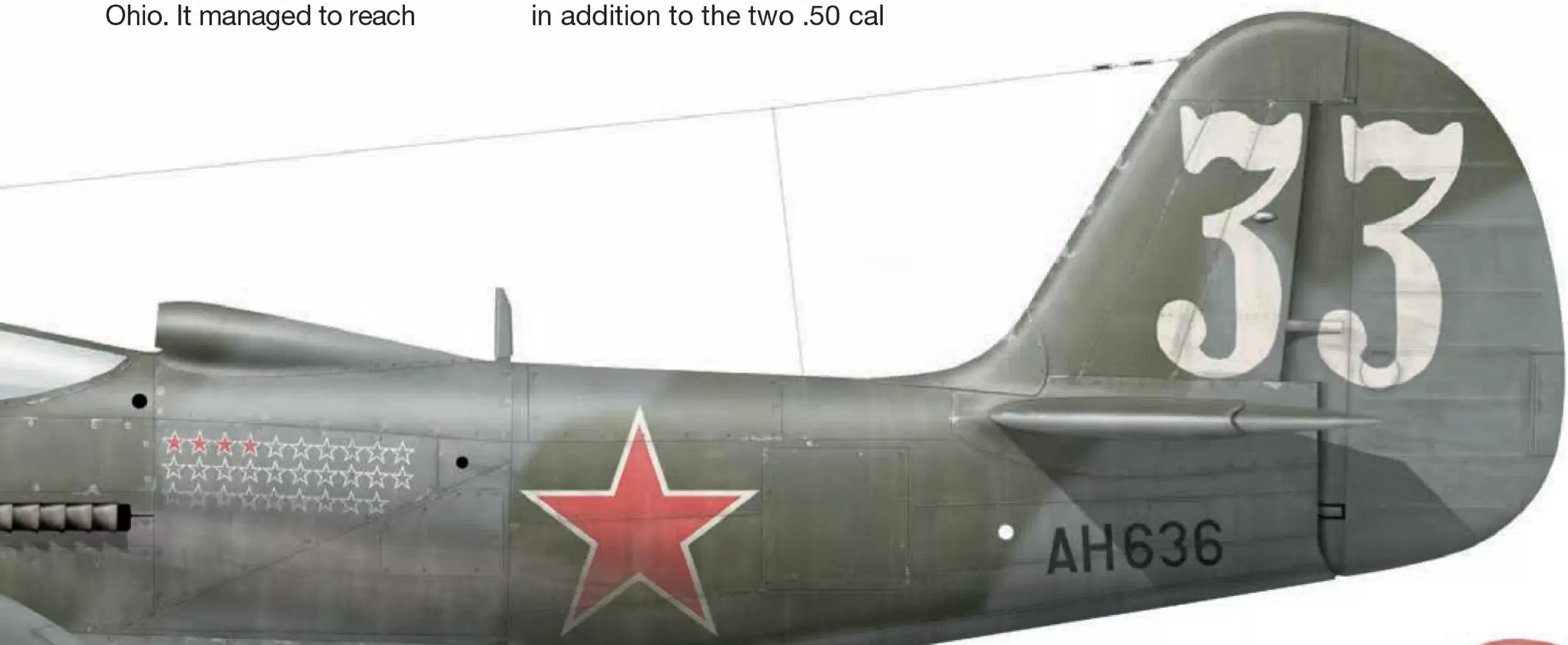
However, it was decided that the type's top speed could be improved still further if the scoop was removed to reduce drag. Therefore, the turbo-supercharged V-1710 was swapped for a V-1710 with only a single-stage single-speed supercharger.

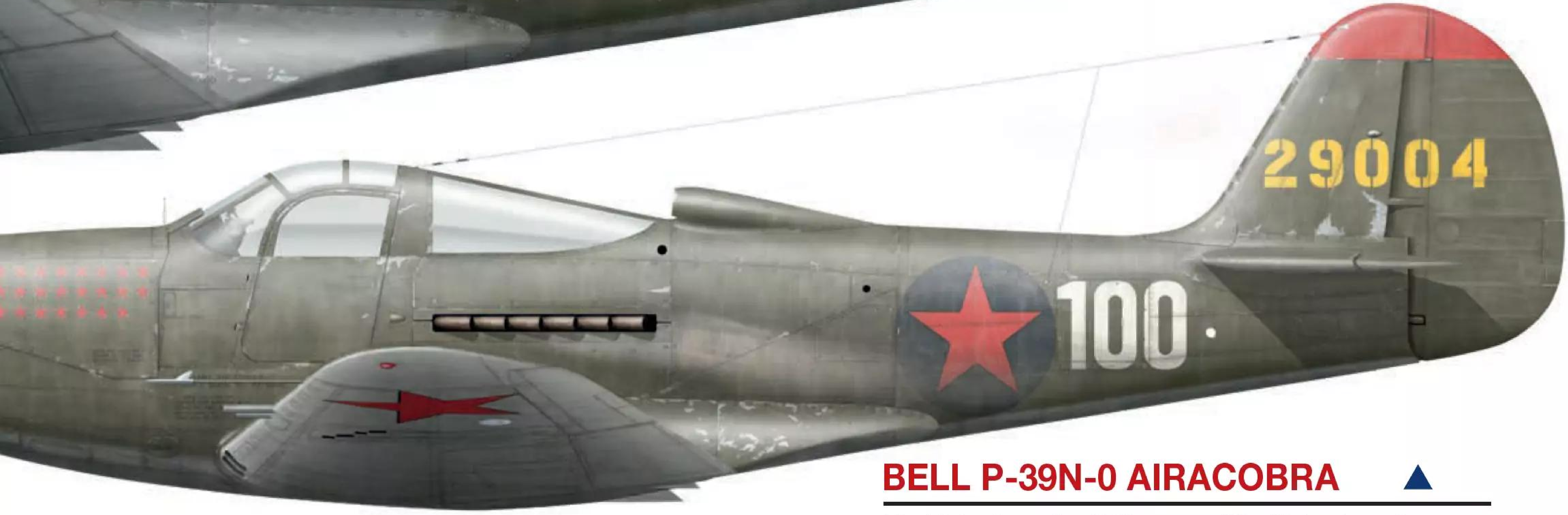
A total of 13 YP-39s were ordered for evaluation by the Army in the latter configuration. These were later modified to include a pair of .30in machine guns in addition to the two .50 cal guns already fitted. Losing the turbo meant the aircraft was simpler and cheaper to build but its performance suffered dramatically as a result. It could no longer perform high-altitude operations and speed was reduced. Even so, an order for 80 full production P-39 Airacobras was placed on August 10, 1939.

The first 20 examples, designated P-39C, was assessed without armour or self-sealing fuel tanks and found to be unsuitable for combat operations. The other 60

## BELL P-400 AIRACOBRA ▼

**Kapitan Ivan Dmitriyevich Gaydayenko of the 19 GIAP flew this ex-RAF P-400 while based at Shongay in the USSR during the autumn of 1942. He achieved seven aerial victories plus 23 shared.**





## BELL P-39N-0 AIRACOBRA ▲

**The highest scoring P-39 ace, and the highest scoring ace flying any American fighter design, was Mayor Aleksandr Ivanovich Pokryshkin of the 16 GIAP. This was the aircraft he flew on the Ukrainian Front during August 1943. Pokryshkin was the first person ever to be made a Hero of the Soviet Union three times over and towards the end of the war he spent most of his time training other pilots, having been made a famous hero by the Soviet propaganda machine. During 560 combat sorties he scored 59 victories in air combat plus six shared.**

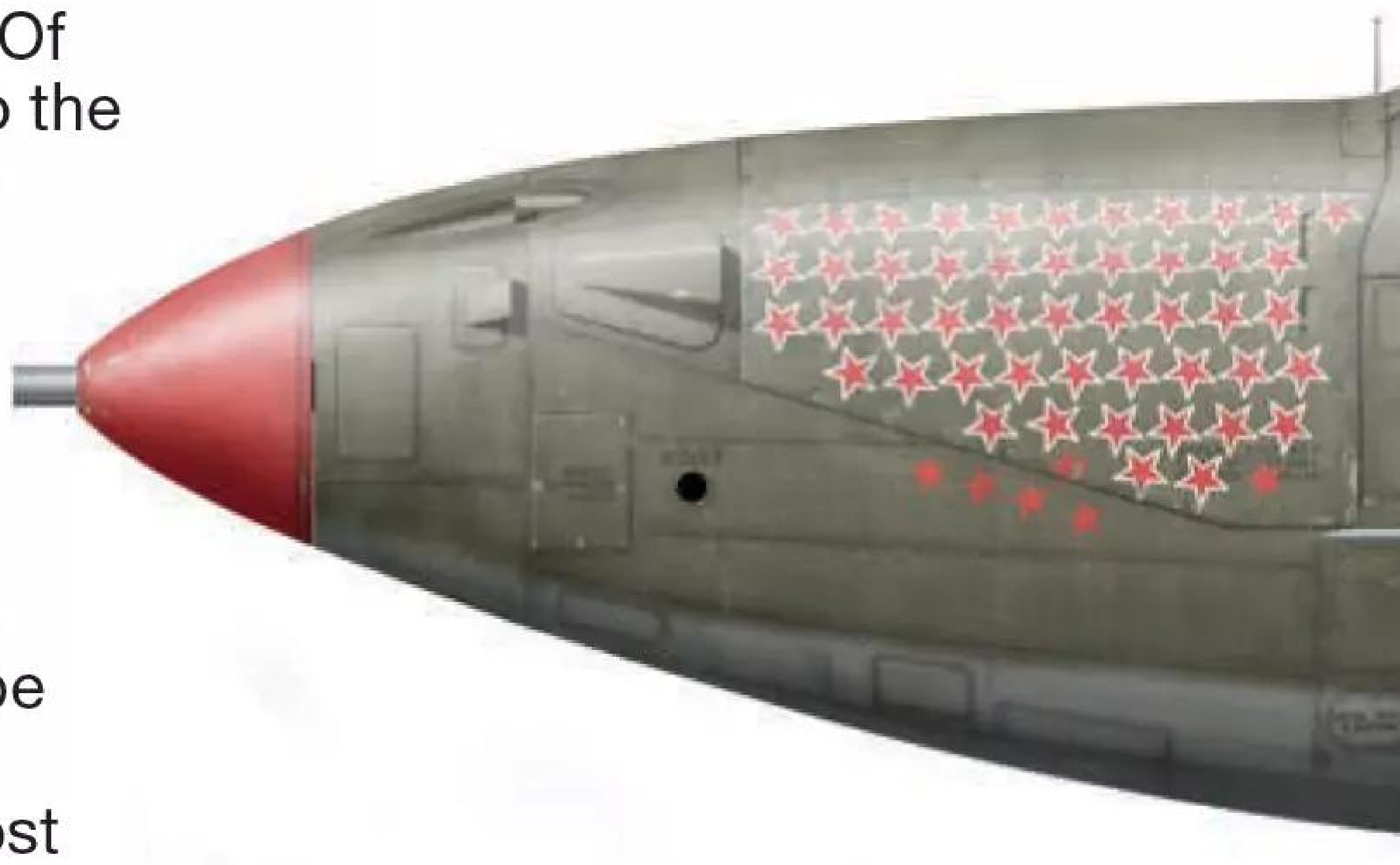
machines, the P-39D, had the armour and improved tanks.

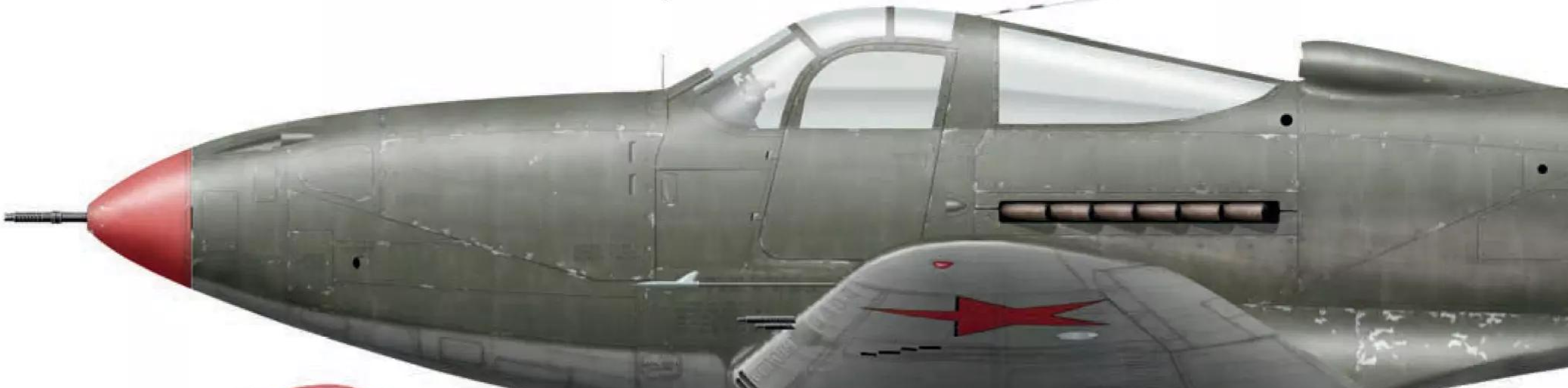
Britain placed an order for 386 P-39Ds in September 1940, fitted with a .79in Hispano-Suiza HS.404 cannon and six .303 machine guns. This was later increased to an order of 675 aircraft. However, testing with 601 Squadron a year later revealed that the type's performance, particularly at altitude, was inadequate and only 80 examples entered service with the unit, these being used for only one combat mission before 601 was re-equipped with Spitfires. All RAF Airacobras were shipped as aid to the Soviet Union, except one which was retained for testing purposes.

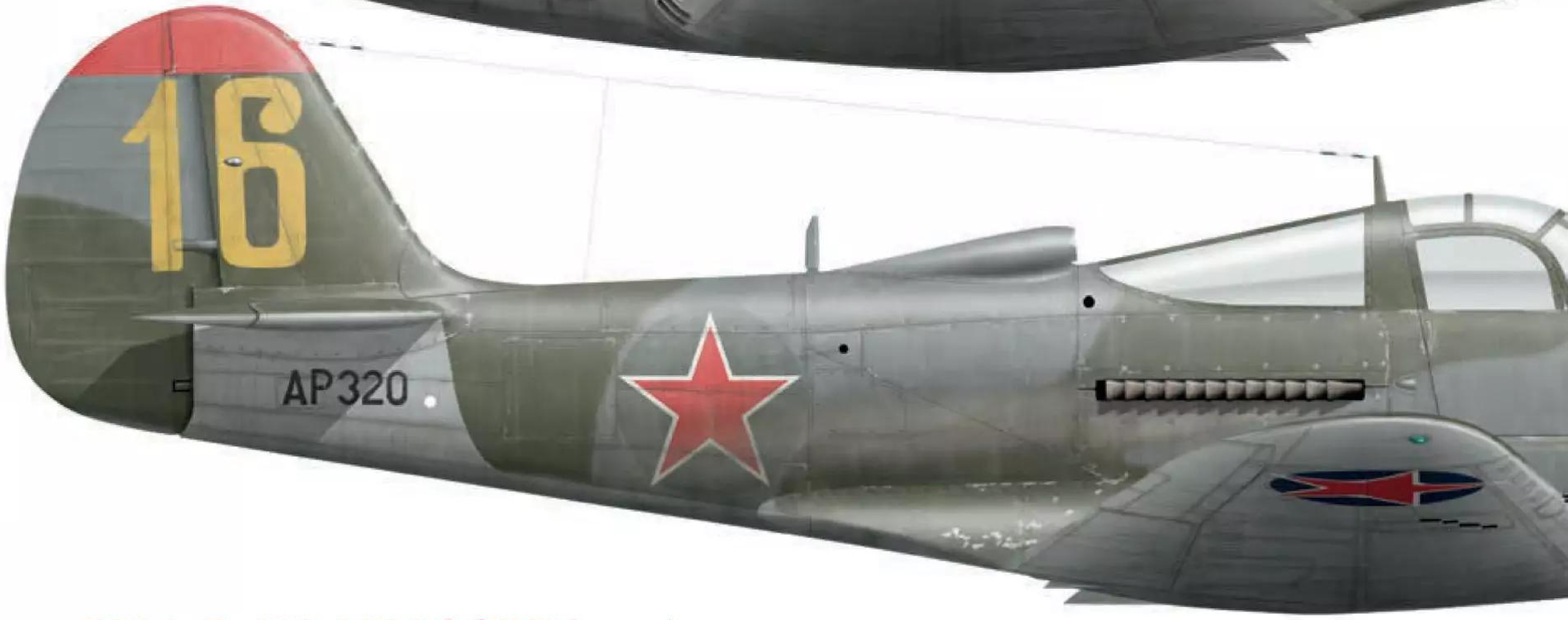
The USAAF requisitioned another 200 P-39s from the RAF order after the attack on Pearl Harbor and sent them to the Fifth Air Force stationed in Australia as the P-400. However, the main user of the Airacobra during the Second World War was the Soviet Union.

By December 1941, some 600 had been produced and this number had grown to 9558 by the time production ceased in August 1944. Of these, 4773 were sent to the Soviets under the Lend-Lease programme. Most of these were P-39Ns and P-39Qs sent via Alaska and then on through Siberia.

The P-39 proved to be more successful on the Eastern Front where most air-to-air combat took place at low level and the aircraft's virtues of strong construction, good visibility, decent armour protection, powerful radio gear and heavy armament counted for more than raw speed. •



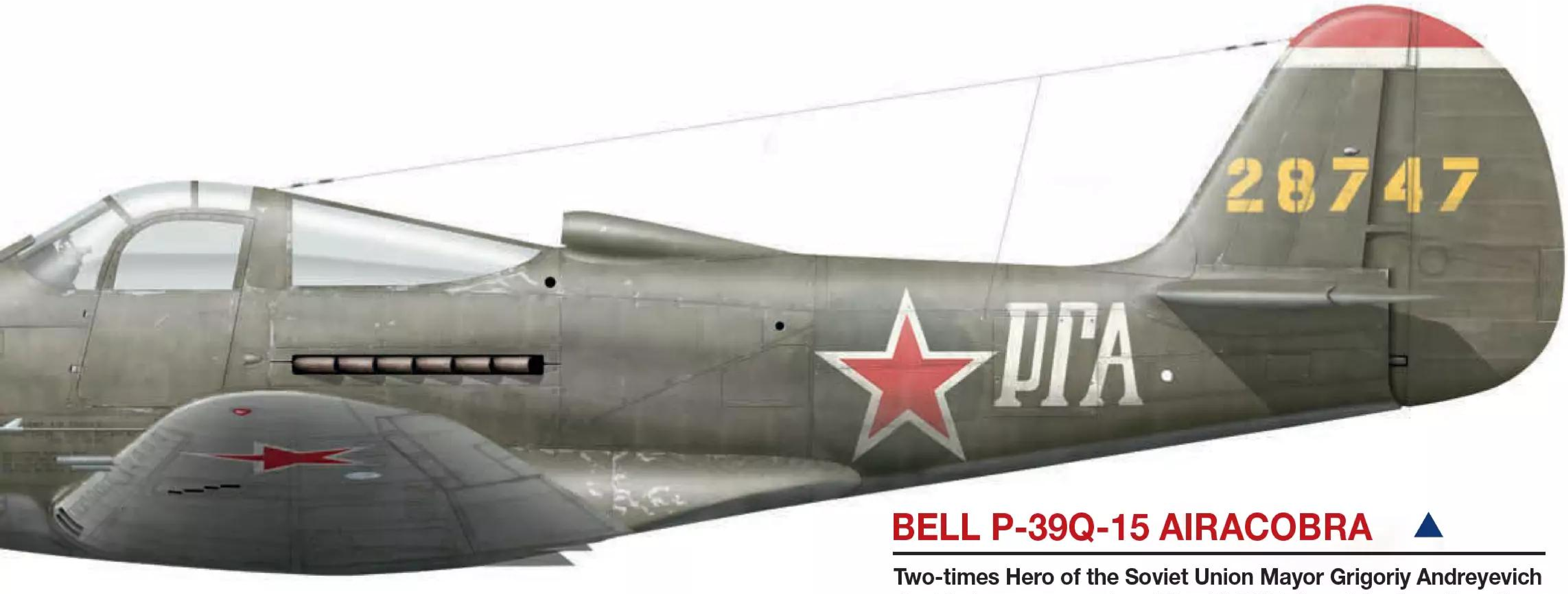




LOW LEVEL COMBAT WAS WHERE THE P-39 EXCELLED

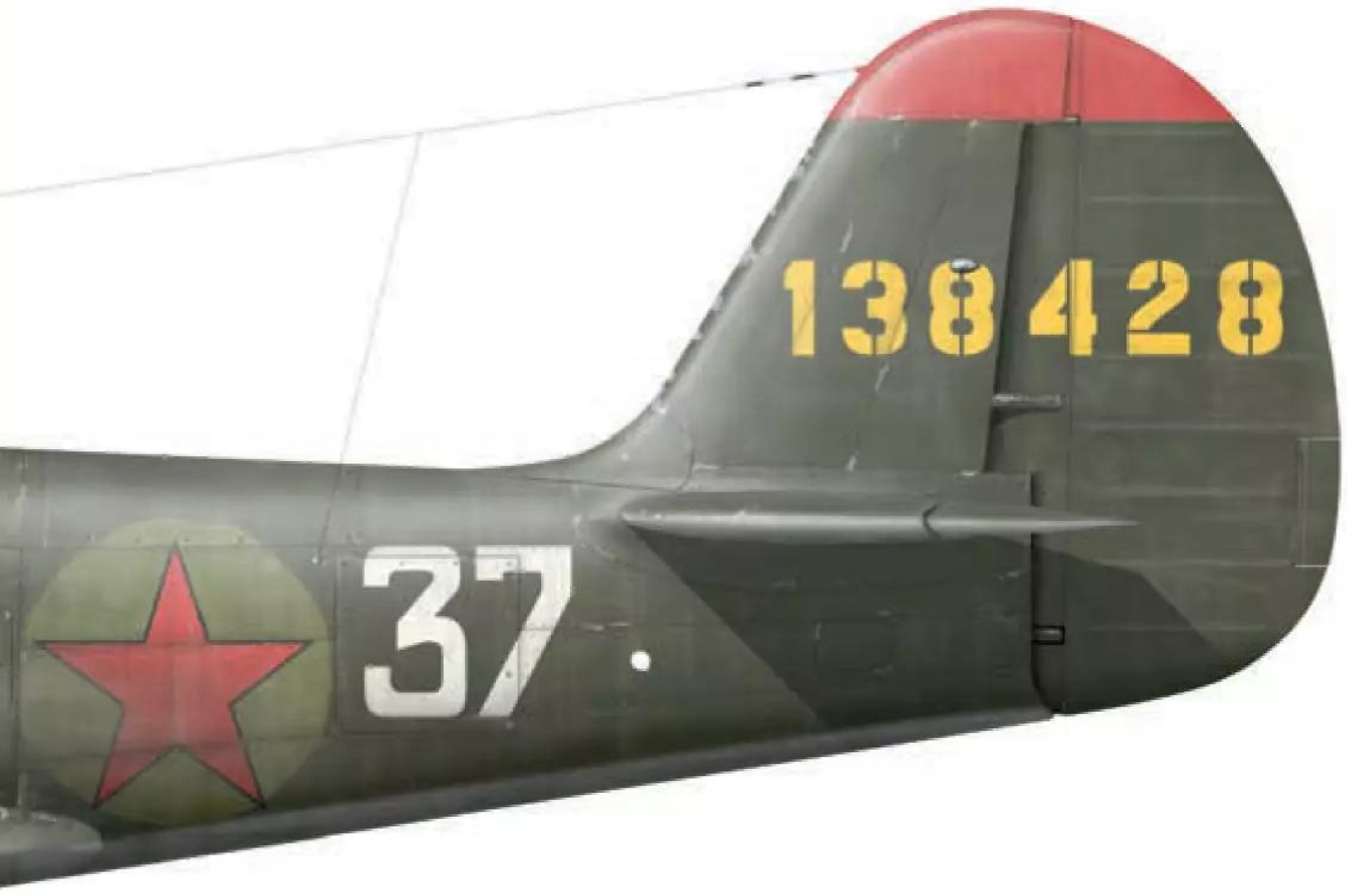
## BELL P-400 AIRACOBRA ▶

**No 601 Squadron, RAF, flew just one combat mission with their P-400s – a strafing run over France – on October 9, 1941. This is how the type looked during its brief stint in service with the unit, stationed at Manston in England. As with most other US fighter types, the British ordered very early examples of the P-39 (as the P-400) and found their performance disappointing – only for the US to then improve them later in the war.**



## BELL P-39Q-15 AIRACOBRA ▲

Two-times Hero of the Soviet Union Mayor Grigoriy Andreyevich Rechkalov, commander of the 16 GIAP, flew this aircraft on the Ukrainian Front during June 1944. During his 450 combat sorties he achieved 56 victories in air combat plus six shared, most of these while flying a P-39. He survived the war and lived in Moscow until his death in 1990.

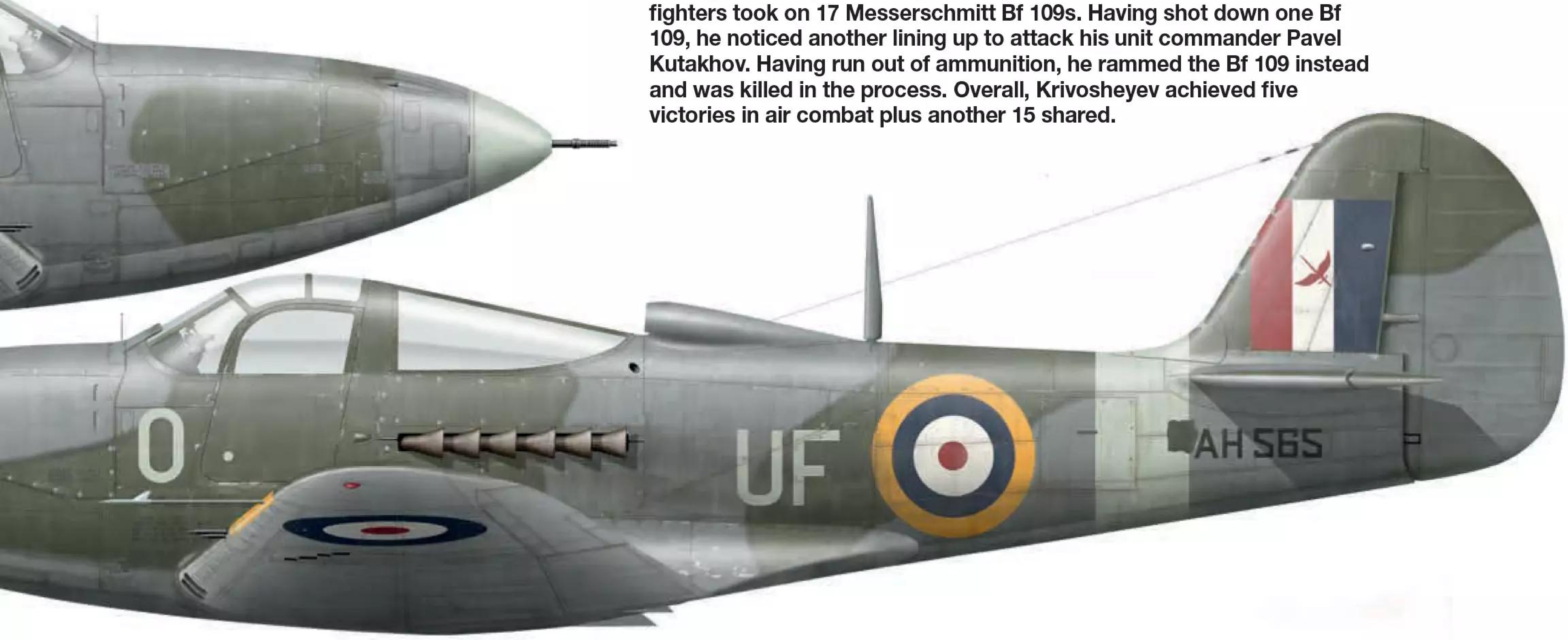


## BELL P-39D-2 AIRACOBRA ◀

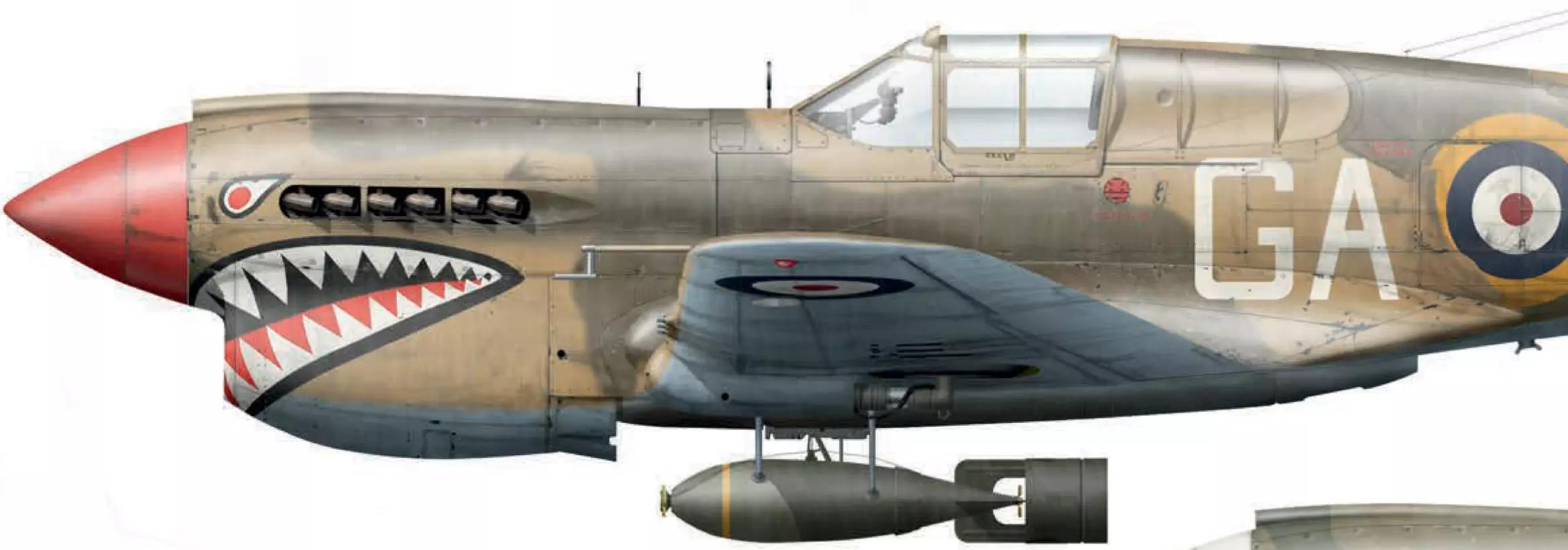
Kapitan Vadim 'Boroda' Fadyev, commander of 16 GIAP's 3rd Squadron, based at Kuban in the USSR flew this P-39 on May 5, 1943. On that day Fadyev, whose nickname means 'The Beard', was involved in aerial combat above the Kuban bridgehead against some of the Luftwaffe's most experienced aces. Among them was Hauptmann Günther Rall – who shot down Fadyev, at that point one of the VVS's highest scoring aces with 21 victories plus one shared. The Soviet pilot managed to bring his Airacobra down intact in a swamp but he had suffered fatal wounds and died in his cockpit before help could reach him.

## BELL P-400 AIRACOBRA ◀

This ex-RAF Airacobra was flown by Leytenant Yefim Krivosheyev of the 19 GIAP, stationed at Shonguy in the USSR during September 1942. On September 9, Krivosheyev took part in a battle where 11 Soviet fighters took on 17 Messerschmitt Bf 109s. Having shot down one Bf 109, he noticed another lining up to attack his unit commander Pavel Kutakhov. Having run out of ammunition, he rammed the Bf 109 instead and was killed in the process. Overall, Krivosheyev achieved five victories in air combat plus another 15 shared.



# CURTISS P-40 TOMAHAWK/KITTY



1938-1958

**It might have lacked the glamour of the Spitfire or the macho charisma of the Mustang but the Curtiss P-40 was just as vital to the Allied war effort. It served around the world and proved to be both rugged and adaptable.**

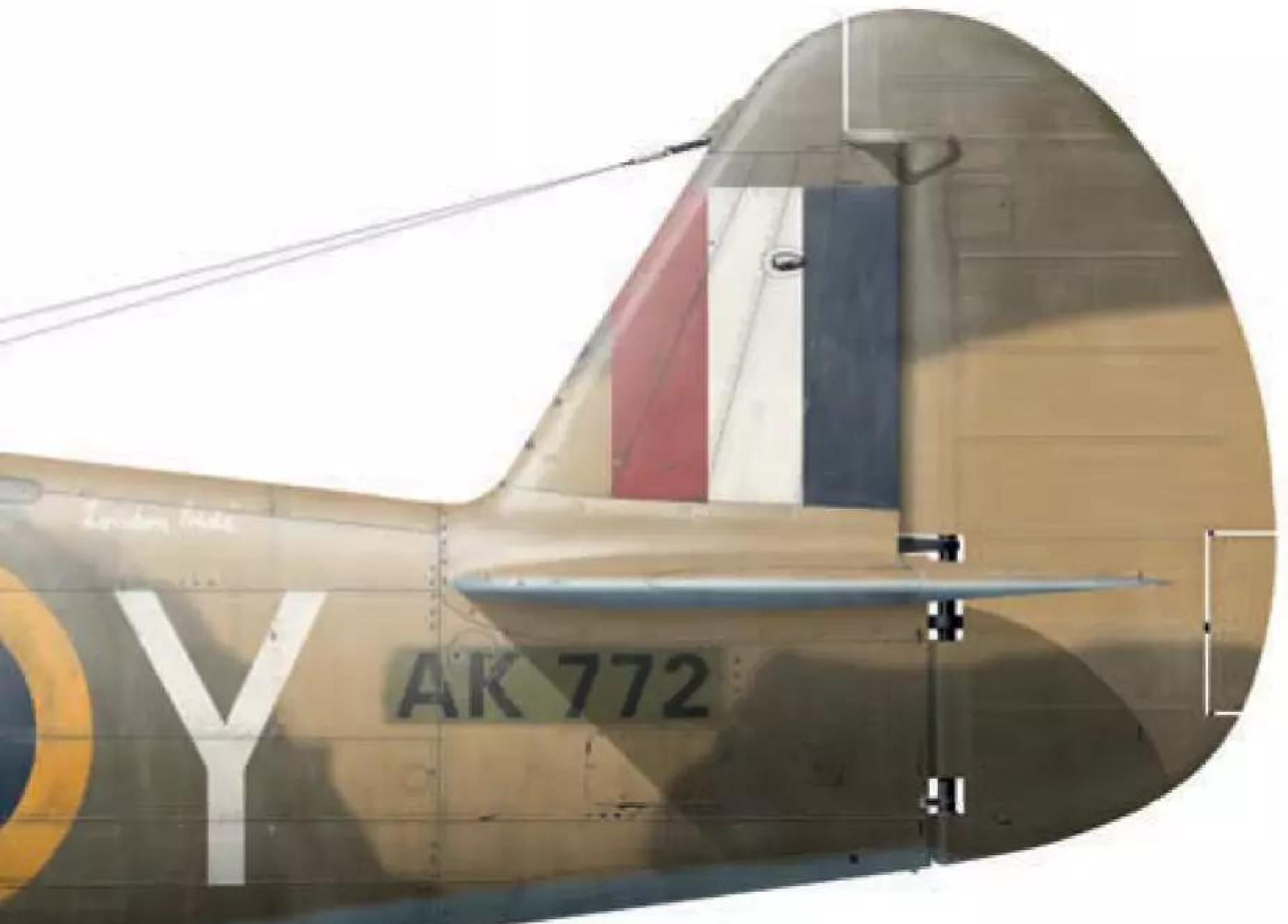
Like many of the war's most successful fighters, the development history of the P-40 began during the mid-1930s. The US Army Air Corps launched a competition in early 1935 to decide on a replacement for the Boeing P-26 Peashooter and designs from four companies were put forward.

All four of the contenders, from Curtiss-Wright, Seversky, Vought and Consolidated, were modern-looking low-wing monoplanes. All featured retractable undercarriages, all had fully enclosed cockpits and all were to be made of metal with using a stressed-skin construction.

The Curtiss entry was the Model 75, nicknamed the 'Hawk 75' since every Curtiss fighter since 1923 had been named 'Hawk' no matter how different they were from one another. With a promising design in prospect, the Army handed Curtiss a contract to build a prototype powered by a 900hp Wright air-cooled radial engine.

While the competition was not announced until 1935, both the Model 75 and the Seversky entry, the two-seater SEV-2XP, had been largely completed in 1934 and so were ready almost from the word go – the Curtiss machine as a private venture and the Seversky as an offshoot from

# HAWK/WARHAWK

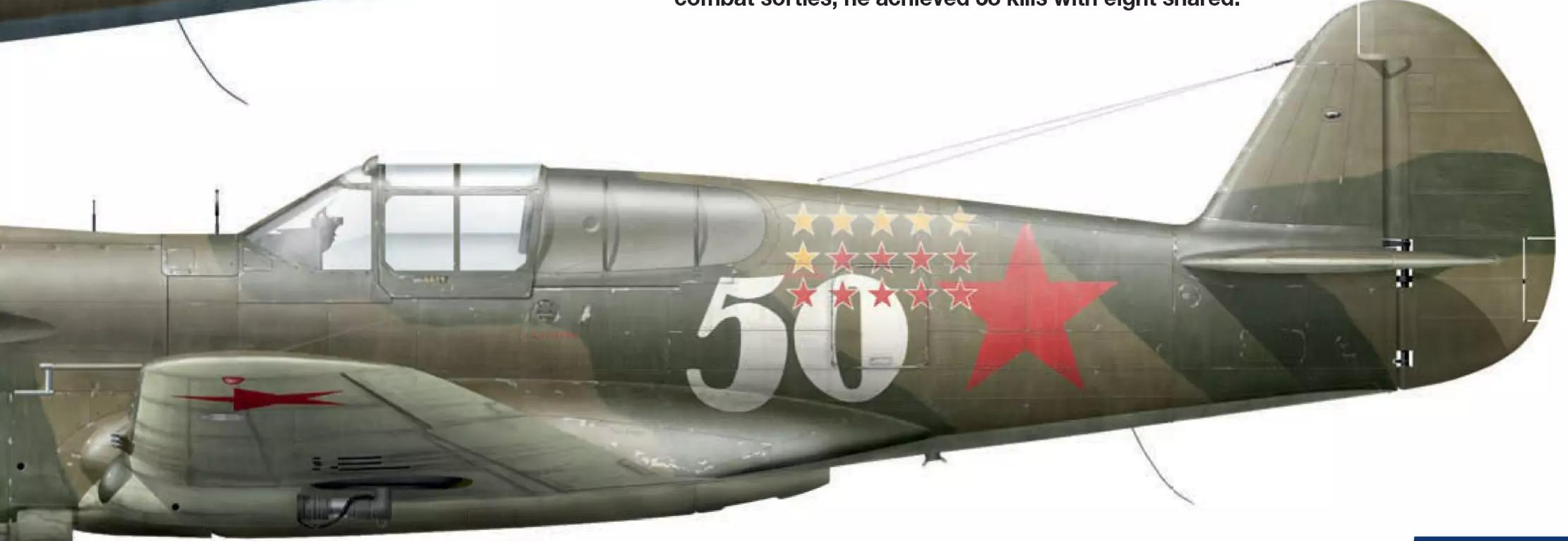


## CURTISS P-40 KITTYHAWK MK.I

**The famous 'shark mouth' design came to be associated with the P-40 after being applied by 112 Squadron, RAF, fighting in Libya. This example was flown by Sergeant Henry G Burney from Gambut in March 13, 1942. Burney had 'London Pride' painted in small white letters above the 'Y' of GA-Y and scored five victories in air combat.**

## CURTISS P-40E

**The 154 IAP was one of the first Soviet units to be equipped with the P-40 Tomahawk and during early 1942 received its first P-40E Warhawks. This was the personal aircraft of Mayor Petr Afanasevich Pokryshev while he was stationed at Plekhanovo in the USSR during the summer of 1942. In June 1942 his score of victories stood at 11 with seven shared – within two months he had doubled it. His flying career was ended in September 1943 when he suffered crippling injuries in a crash following a training flight. From a total of 282 combat sorties, he achieved 38 kills with eight shared.**



an earlier project. The Vought and Consolidated machines were further behind in their development.

First flown on May 6, 1935, the Model 75 was ready in time to compete in a series of fly-offs planned for June. The SEV-2XP prototype, however, was damaged in transit to the trials and Seversky seized upon the opportunity to quickly reconfigure it as a single-seater – the SEV-1XP. Curtiss protested and the formal head-to-head event was delayed until April 1936.

Both companies now worked to improve their aircraft and in the meantime the other two competitors had the opportunity to get their prototypes completed – Vought's V-141 and Consolidated's single-seat version of the PB-2.

The Curtiss aircraft that competed in the April 1936 fly-offs was the Model 75B, which featured a reworked fuselage with scalloped rear windows for better visibility and most importantly a new engine – the 950hp XR-1820-39 Cyclone. Unfortunately, this proved to be an error since the engine failed to perform as planned and a top speed of 285mph was all that could be managed.

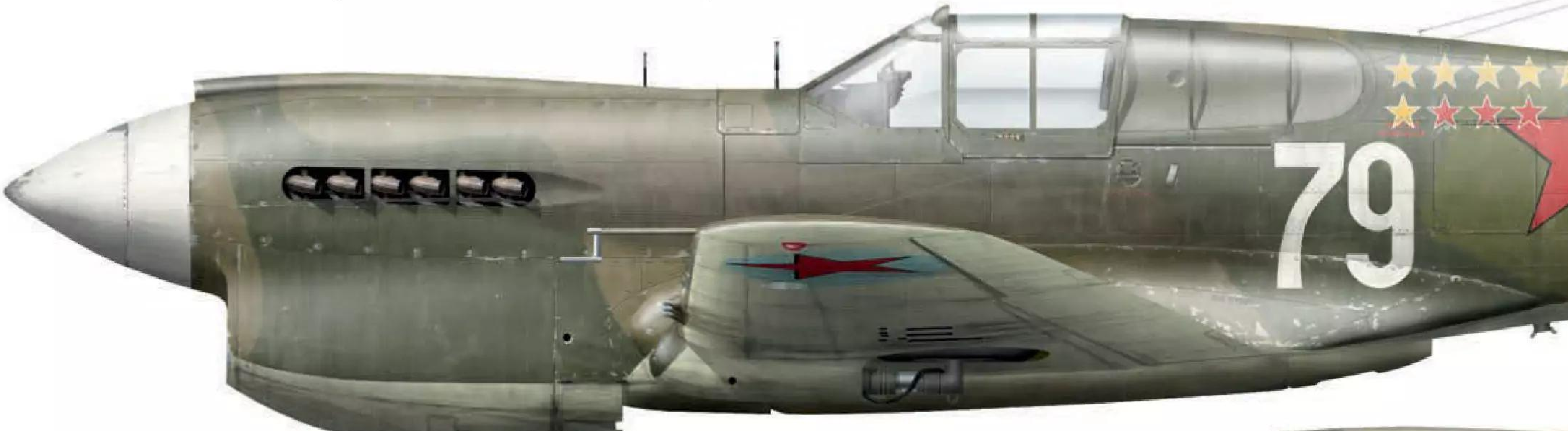
The V-141 and PB-2 did even worse and the SEV-1XP, though it scarcely managed to outperform the Model 75B, was declared the winner. Seversky received an order for 77 production models as the P-35 on June 16, 1936, but at the same time Curtiss received an order for three more prototypes of the Model 75B under the new official designation Y1P-36 as a backup.

A further Army Air Corps fighter competition was held in

**THE ORIGIN OF THE P-40 CAN BE TRACED BACK TO THE MID-1930S**

## CURTISS P-40E ▼

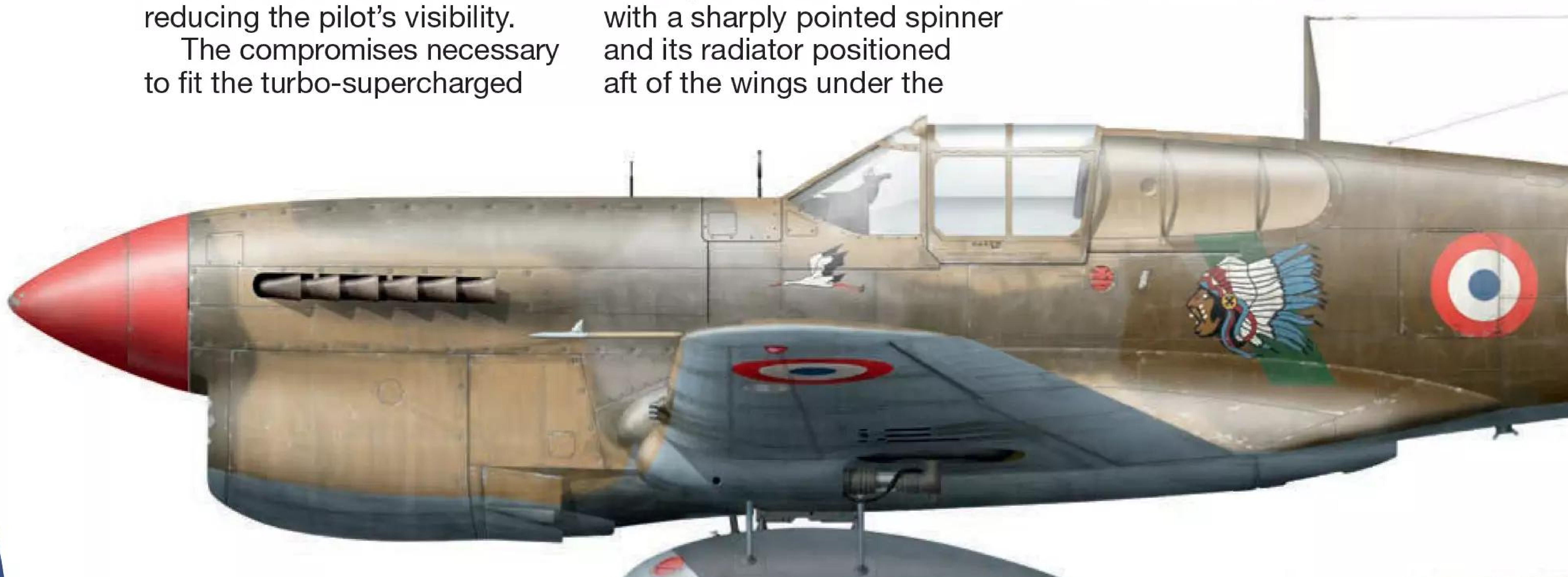
**Starshiy Leytenant Nikolay Andriyanovich Zelenov of the 154 IAP flew this P-40E while based at Plekhanovo, USSR, during the summer of 1942. He was killed in action on June 29, 1944 having scored 31 victories in air combat plus 10 shared.**



1937 and this time the Curtiss design won, primarily thanks to its remarkable manoeuvrability, with a new order being placed for 210 P-36A fighters. Curtiss was also asked to work on a version of the P-36 that could be powered by the new turbo-supercharged V12 Allison V-1710 engine. The company modified the original Model 75B airframe to accept the engine and the new variant was designated XP-37. Its performance was exceptional but the engine's supercharger proved unreliable and its bulk meant the cockpit had to be moved further to the rear, reducing the pilot's visibility.

The compromises necessary to fit the turbo-supercharged engine were not outweighed by the performance benefits and the project was about to be shelved when Curtiss offered a new proposal – why not fit the Allison V-1710 with a mechanically driven supercharger? This would make the powerplant less bulky and more reliable, and would not necessitate the extreme configuration changes that had made the XP-37 a failure.

This new design was the Curtiss Model 81, the Army giving it the designation XP-40. The prototype made its first flight on October 14, 1938, with a sharply pointed spinner and its radiator positioned aft of the wings under the fuselage. It was not as fast as expected initially but a series of modifications eventually saw it achieve 366mph at 15,000ft. Among these changes was the relocation of the radiator to the underside of the nose, giving the P-40 its characteristic look.

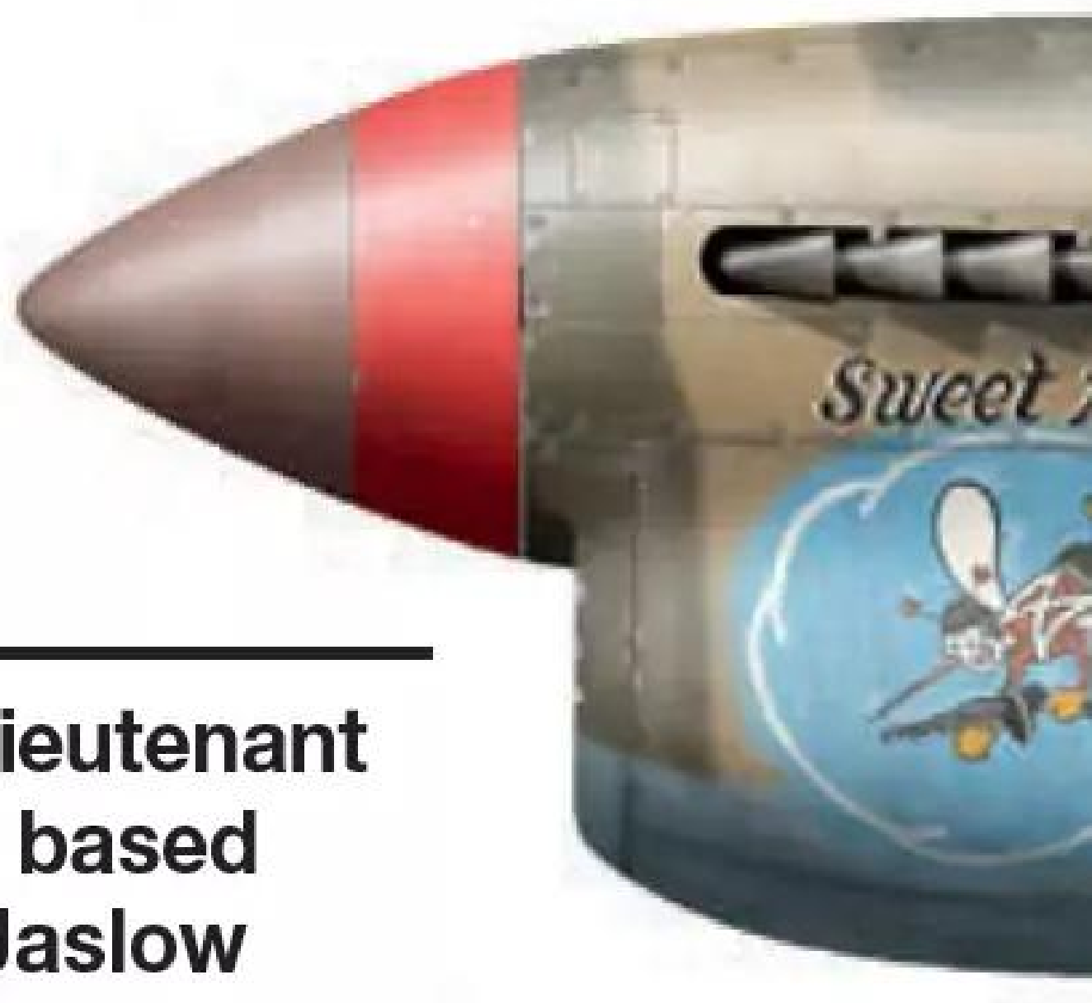


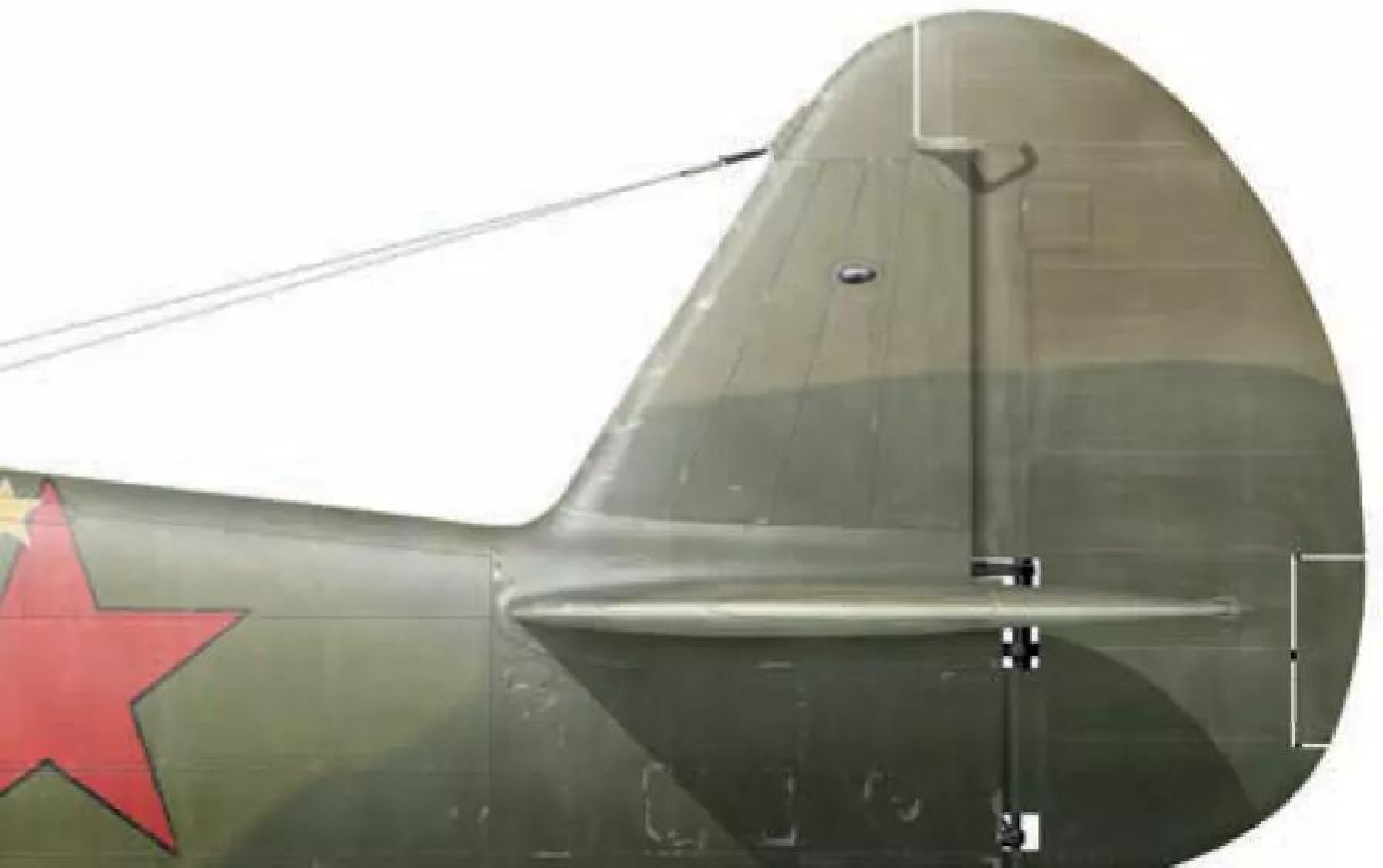
## CURTISS P-40F-1 ▲

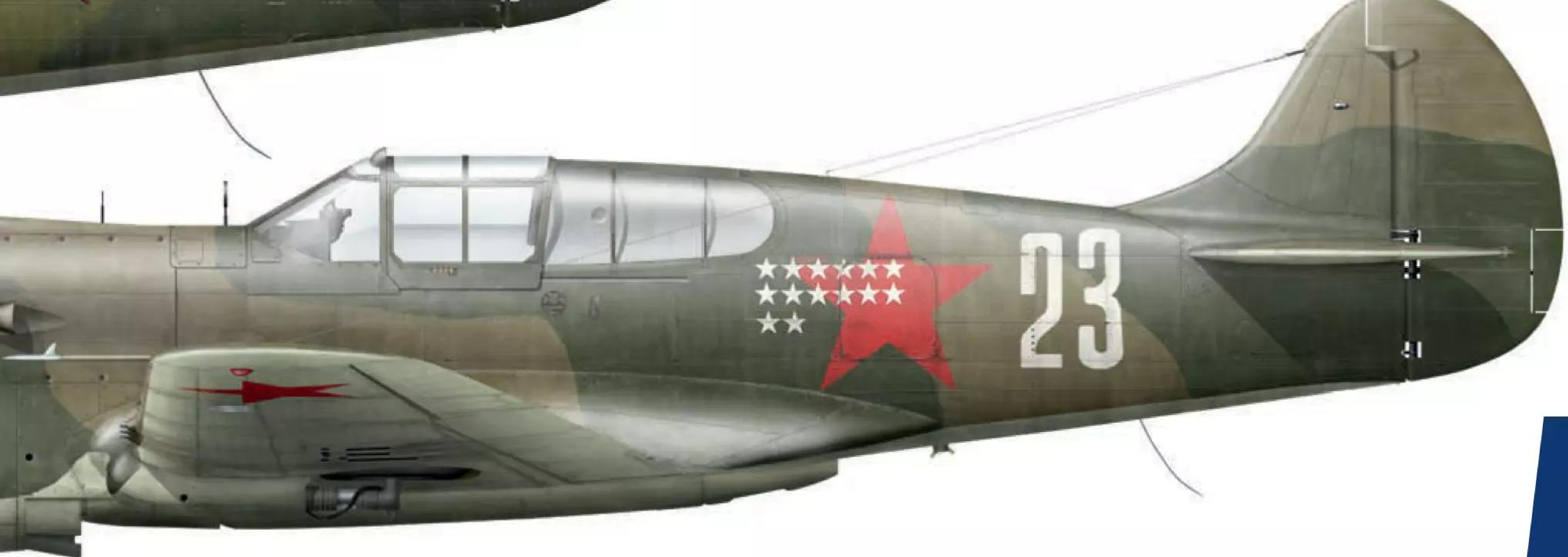
**French pilot Sergent Chef Jean Gisclon of Groupe de Chasse II/5 flew this P-40F-1 while stationed at Sidi Ahmed in Tunisia during January 1943. Gisclon claimed six victories from 300 sorties but recently historical research has revised this down to two.**

## CURTISS P-40F-15 ▶

**'Sweet Bets', a P-40F-15, was piloted by 1st Lieutenant Charles 'Jazz' Jaslow of the 87th FS, 79th FG, based at Causeway LG in Tunisia during April 1943. Jaslow scored one confirmed victory from 80 combat sorties.**







## CURTISS P-40K

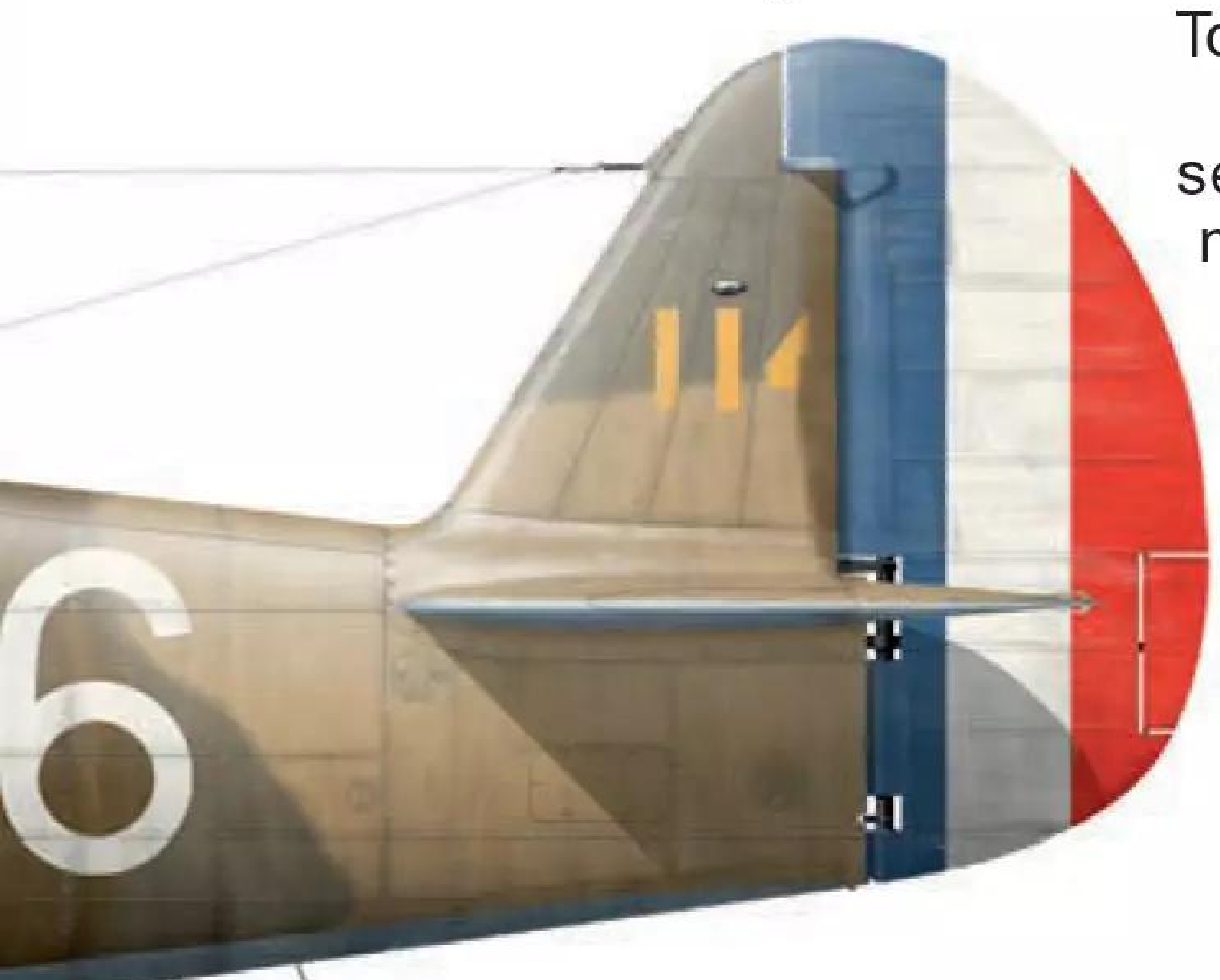
**This P-40K was flown by Starshiy Leytenant Nikolai Kuznetsov of the 436 IAP, based at Lake Seliger, USSR, on December 26, 1942. That day his was one of six P-40Ks sent to escort Il-2s in a bombing run on surrounded German forces at Velikiye Luki. The formation was attacked first by Bf 109s then Fw 190s, with Kuznetsov rescuing one of the Il-2s that was in trouble by shooting down a Bf 109 that was on its tail for his 26th and final aerial victory. It was the 26th of the month and Kuznetsov's 26th birthday too. That evening in the unit's mess, he was presented with a chocolate cake with '26-26' on top.**

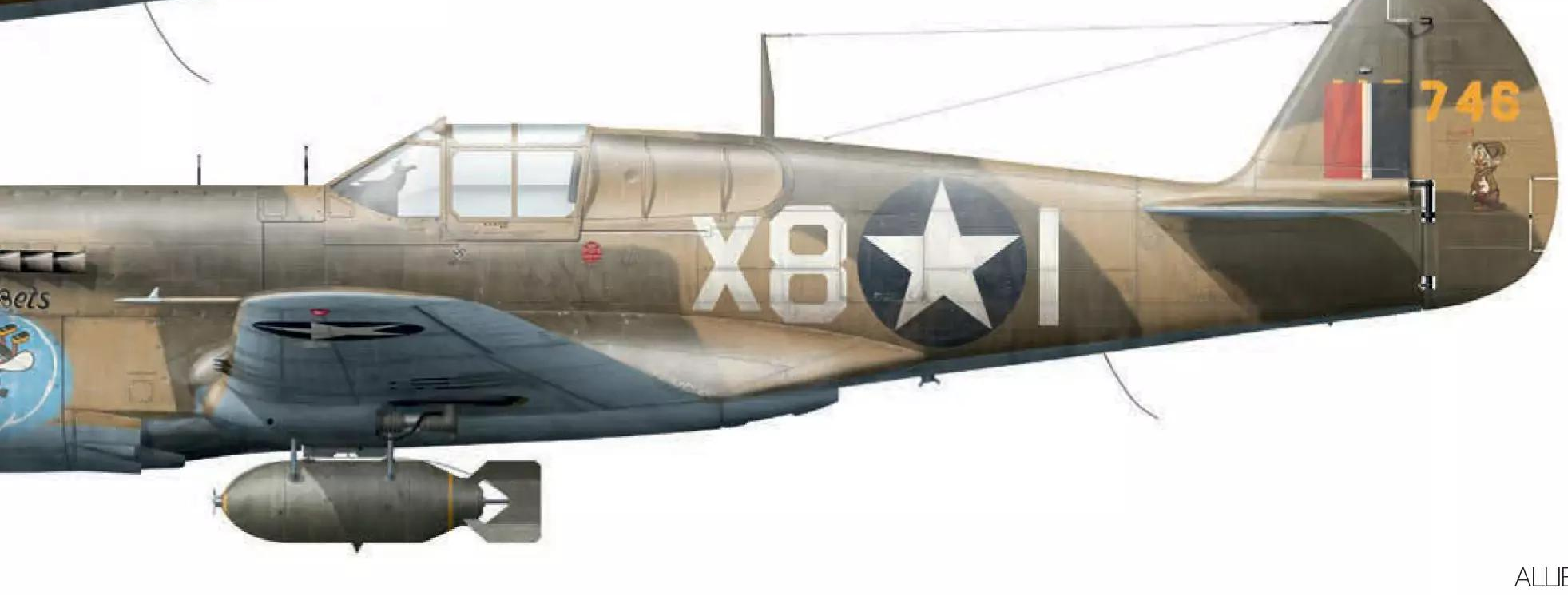
A full production order for 524 P-40s was placed by the Army on April 26, 1939. The production model was armed with two .50 cal machine guns but when France ordered a batch of 140 it specified one .50 cal in the fuselage and four .303in machine guns in the wings. These were never delivered to the original customer, France having capitulated before they were ready, so they were diverted to Britain instead. In RAF service they were known as Curtiss Tomahawk Mk.Is.

The Tomahawk had several problems which made it unsuitable for combat duties in the RAF however. Metric instruments had been installed for the French pilots and French throttle control levers worked the opposite way around to the British and American versions. In addition, the Tomahawk had neither self-sealing fuel tanks nor armour. As a result, they were used mainly for tactical reconnaissance.

When Curtiss was made aware of this, it set about improving the design with armour protection and heavier weaponry – an extra .303 in each wing. The result was the P-40B. Fitting yet another .303 in each wing and adding self-sealing fuel tanks resulted in the P-40C. The US Army Air Corps ordered both. The British government ordered 930 of the latter as the Tomahawk Mk.IIa (with British

**THE RAF STARTED RECEIVING TOMAHAWKS IN SUMMER 1941**





radio gear) and Mk.IIb (with American radio gear).

Making these improvements had dramatically increased the aircraft's weight however – from 7215lb to 8058lb – and top speed fell to 340mph, some 20mph slower than the Bf 109 E. The RAF flew the Tomahawk Mk.II in the Middle East and sent 195 of them to the Soviet Union as aid. No. 112 Squadron was equipped with Tomahawks during the summer of 1941 and it was decided that the aircraft would be given snarling shark mouths based on those they had seen painted on the noses of German Bf 110s flown by ZG 76.

These designs were featured in a colour magazine and read about by members of the American Volunteer Group in Burma, the Flying Tigers, who then painted up their own P-40s with shark mouths. These became so famous that the design came to be adopted by numerous units operating the P-40 elsewhere.

Curtiss attempted to come up with a replacement for the overweight P-40C with a version incorporating and upgraded Allison engine and five machine guns in each wing – the XP-46 – but instead the US Army Air Corps decided that the upgraded engine should simply be installed in the P-40 instead. The British had already ordered the XP-46 and allocated it the name 'Kittyhawk' but on its cancellation they ordered the re-engined P-40 instead and reapplied the name.

The P-40D was therefore known as Kittyhawk Mk.I to the British, although the Americans gave it their own name – Warhawk – and it first flew in May 1941 and had four .50 cal machine guns in its wings. A second version with six .50 cal machine guns was known as the P-40E or Kittyhawk Mk.Ia to the British.

Although the performance of these Allison-engined updates was an improvement on that of the P-40C, Curtiss wanted to improve the P-40s speed and rate of climb above 15,000ft so it installed a Rolls-Royce Merlin engine into the P-40D to create the XP-40F. Owing to concerns about the ability of Rolls-Royce to meet this new additional demand for engines, Packard in the US was given a contract to build 9000 Merlins under licence – 6000 for the RAF and 3000 for the Army Air Corps.

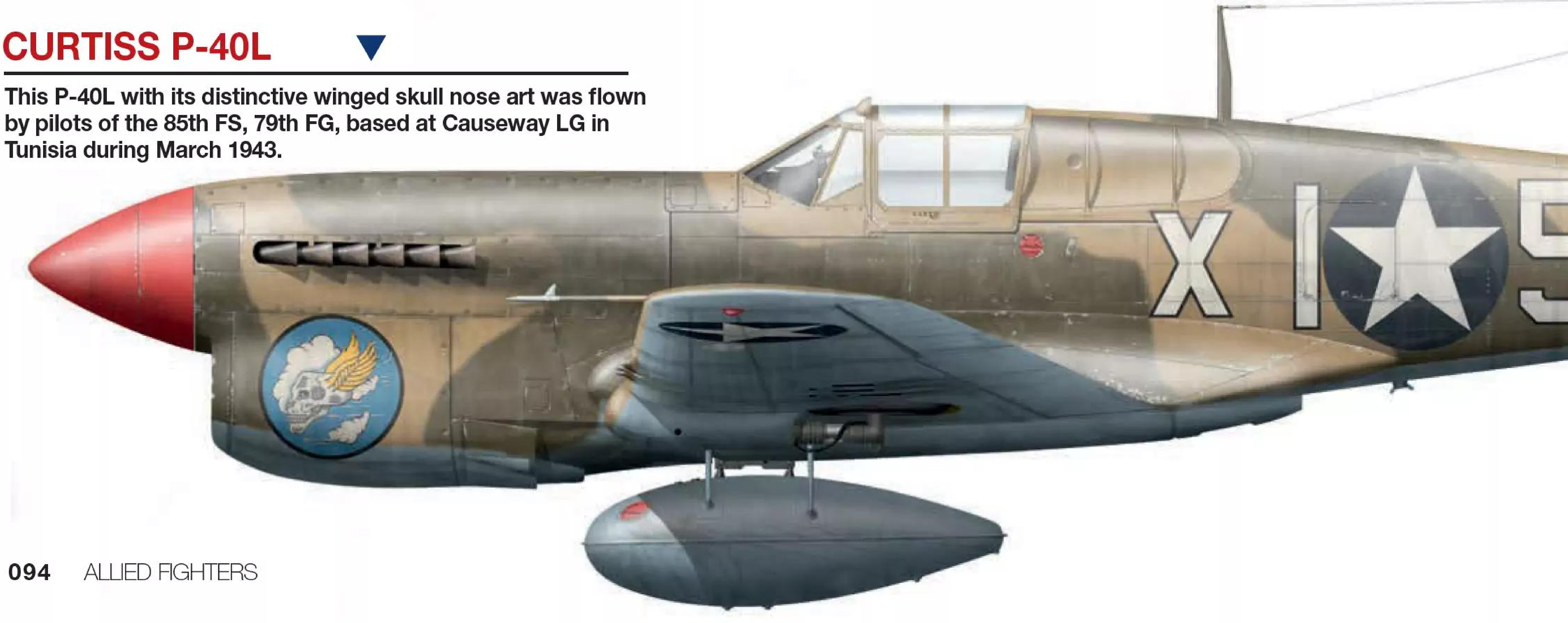
The first production model P-40F Warhawk or Kittyhawk Mk.II flew for the first time in October 1941 and achieved a top speed of 364mph. A lightened version of the 'F' was also built, known as the P-40L.

When the supply of Packard Merlins finally dried up there were still a large number of P-40F airframes available, so these were completed with Allison powerplants and designated P-40Rs.

Another Allison engine upgrade – to the 1325hp V-1710-73 resulted in the P-40K and a lightened version, the P-40M. Despite their differences, both of these were known as the Kittyhawk Mk.III by the RAF.

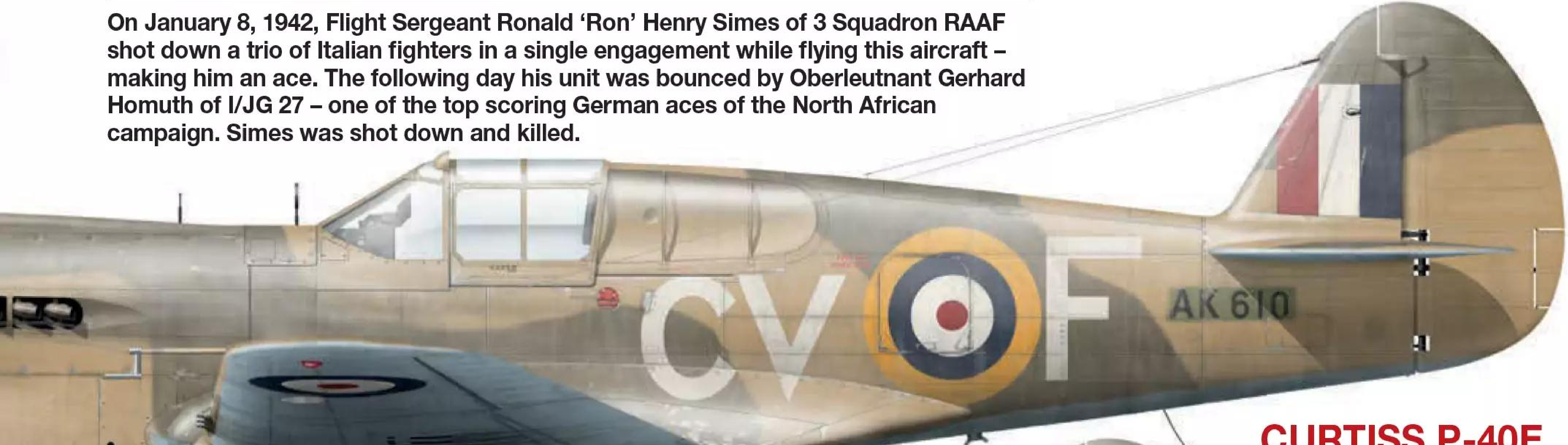
## CURTISS P-40L ▼

**This P-40L with its distinctive winged skull nose art was flown by pilots of the 85th FS, 79th FG, based at Causeway LG in Tunisia during March 1943.**



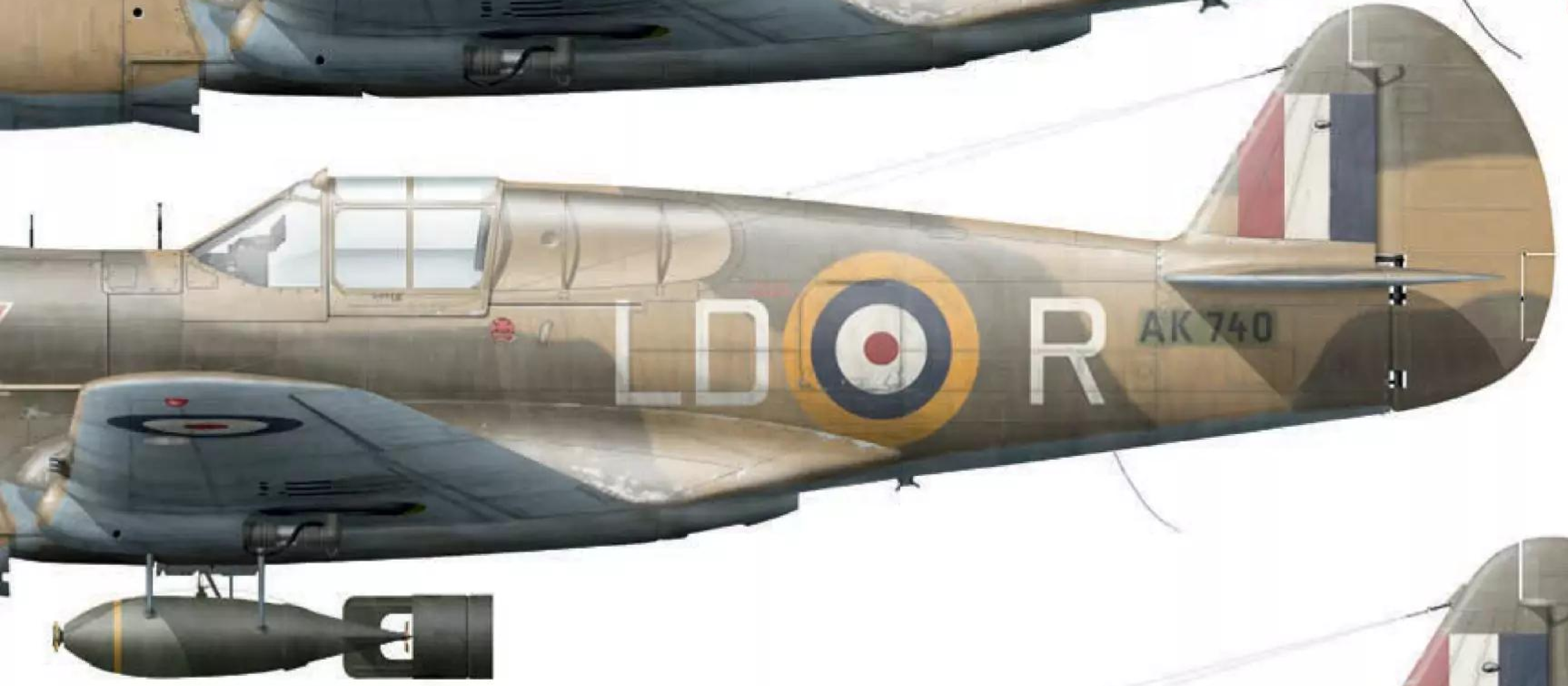
## CURTISS P-40E

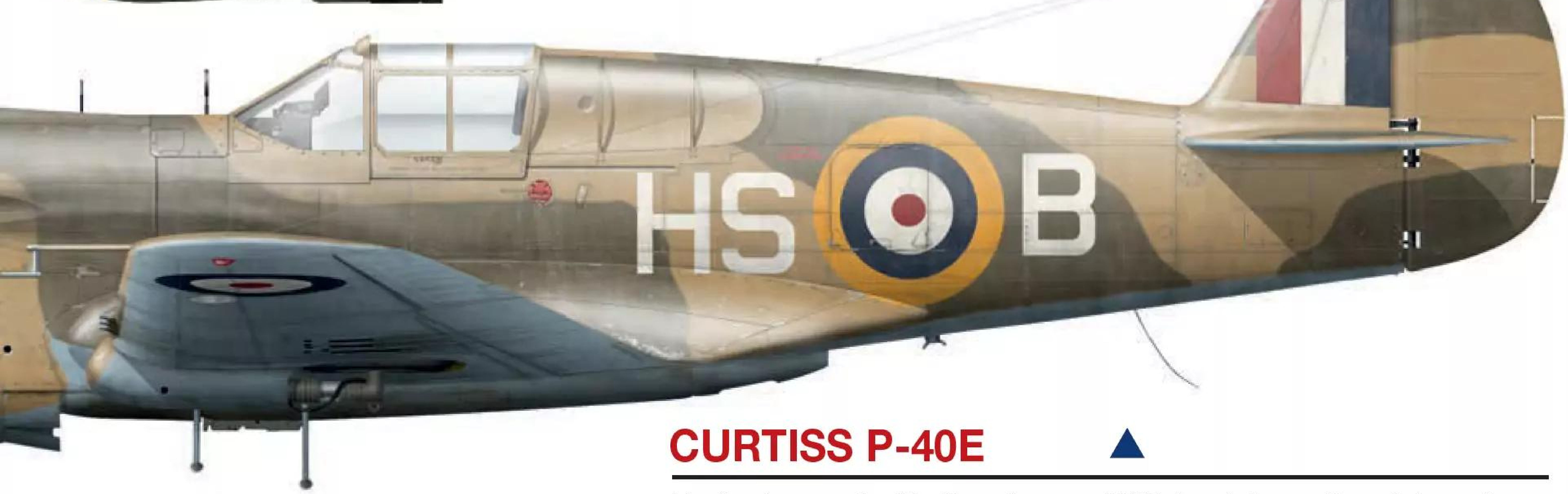
On January 8, 1942, Flight Sergeant Ronald 'Ron' Henry Simes of 3 Squadron RAAF shot down a trio of Italian fighters in a single engagement while flying this aircraft – making him an ace. The following day his unit was bounced by Oberleutnant Gerhard Homuth of I/JG 27 – one of the top scoring German aces of the North African campaign. Simes was shot down and killed.



## CURTISS P-40E

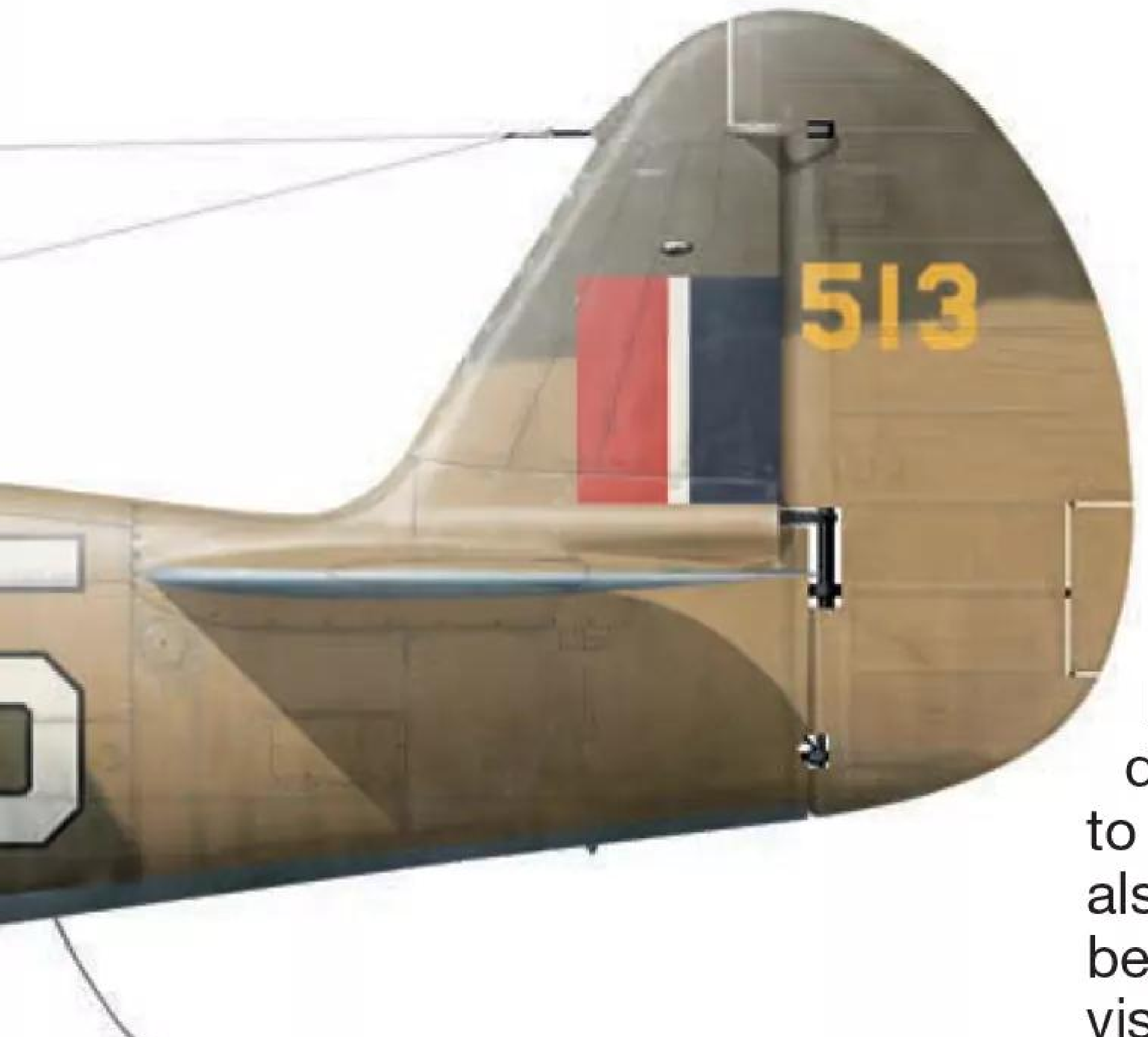
Flight Sergeant Graham G Buckland of 250 Squadron flew this aircraft while stationed at LG 91 in Egypt during the spring of 1942. On May 30 his formation was attacked by Luftwaffe ace Hans-Joachim Marseille and his P-40E was crippled. Buckland bailed out but his parachute failed to open and he was killed on impact. Marseille personally travelled out into the desert and recovered his body before dropping a note over LG91 to explain what had happened.





## CURTISS P-40E

Having been asked to fly a damaged Kittyhawk to another air base for repair, Flight Sergeant Dennis Copping of 260 Squadron, took off from LG 115 in Egypt on June 28, 1942, and disappeared. Seventy years later, Polish oil workers discovered his near-perfectly preserved aircraft crash-landed in the desert. After an intensive search of the surrounding area, Copping's remains were discovered three miles away on a rocky outcrop. He had evidently taken the aircraft's radio and batteries out and tried to get them working before setting off into the desert on foot.



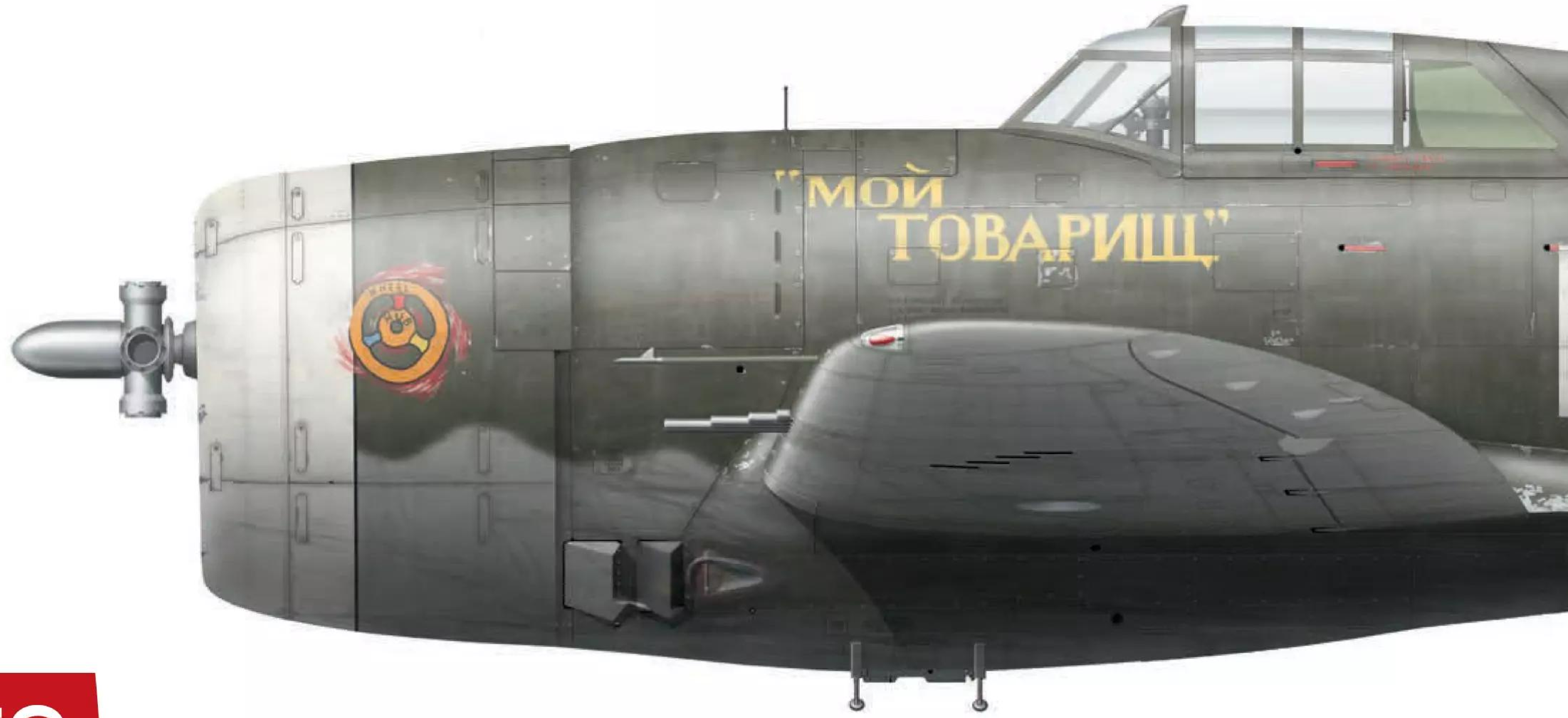
WHEN THE P-51 ARRIVED, ADVANCED P-40 PLANS WERE SHELVED

Curtiss attempted to make further weight-savings by reducing the P-40's fuel tankage and deleting two machine guns to create the P-40N. This also featured more glazing behind the cockpit to improve visibility. The British naturally called it the Kittyhawk Mk.IV.

The last attempt to upgrade the P-40 resulted in the XP-40Q – which featured a 1425hp Allison V-1710-121 engine with a two-stage supercharger. It also had a bubble canopy and clipped wings and was good for 422mph at 20,000ft, but by this point, in 1944, the P-51D was available and only three XP-40Qs were built.

A total of 13,738 P-40s were built all together. •

# REPUBLIC P-47 THUNDERBOLT



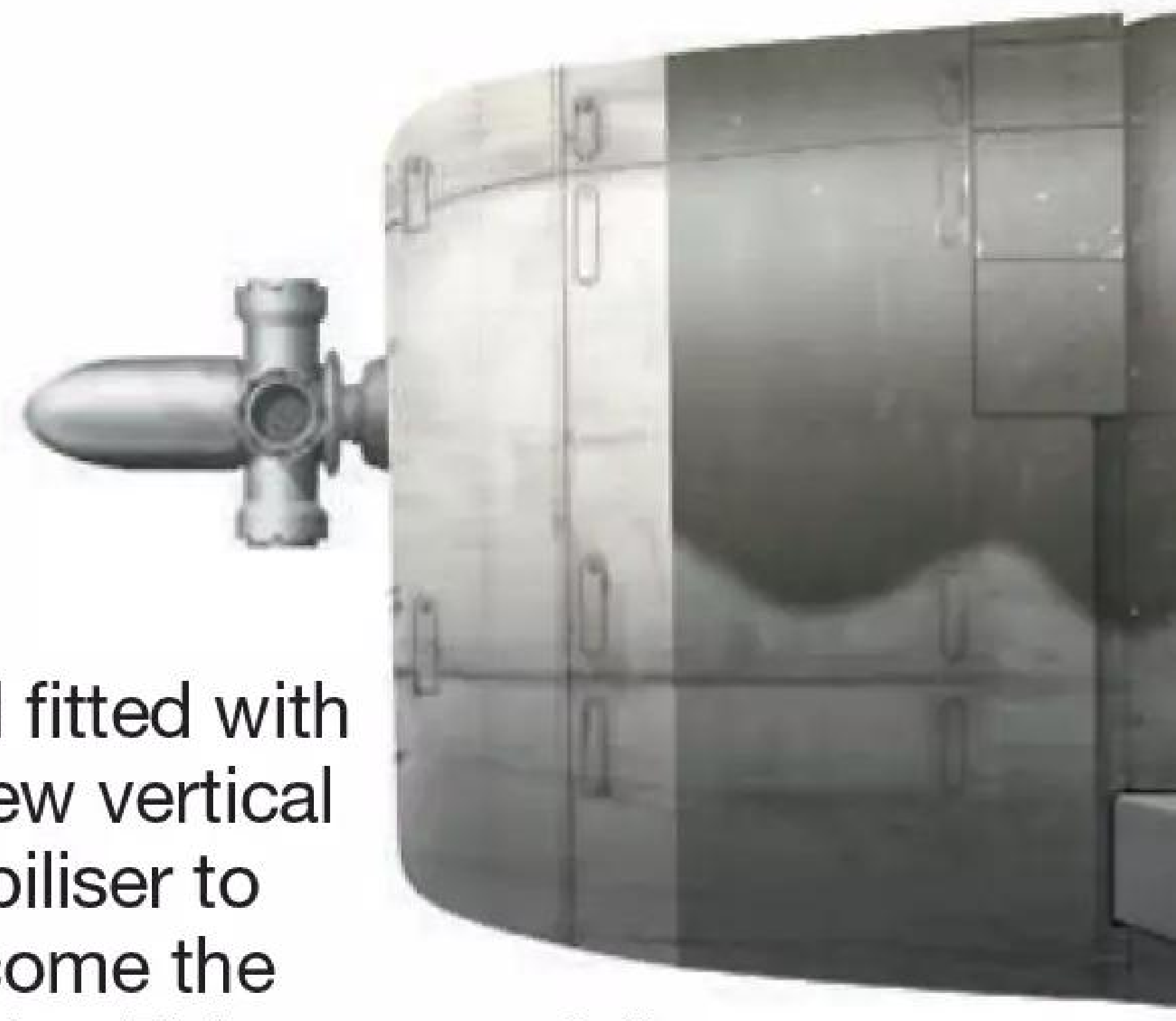
1941-1966

**Heavy and brutally powerful, the P-47 Thunderbolt was one of the USAAF's two main front line fighters alongside the P-51. Able to soak up considerable combat damage and capable of carrying a hefty weapons load, the P-47 became a legend in its own time.**

The origin of the Republic P-47 Thunderbolt can be traced back to the same 1935 fighter competition which ultimately resulted in the Curtiss P-40.

Ranged against Curtiss were three other firms – Vought, Consolidated and Seversky. The latter's entry was the two-seat SEV-2XP, a development of the earlier SEV-3 amphibian, which was almost ready to fly by the end of 1934. After the SEV-2XP was damaged in a crash before competition fly-offs could take place, it was rebuilt as the single-seat SEV-1XP. Further delays saw this re-engined with a Pratt & Whitney R-1830-9 Twin Wasp and fitted with a new vertical stabiliser to become the SEV-7. This successfully won the competition in April 1936 and 77 production models were ordered as the Seversky P-35.

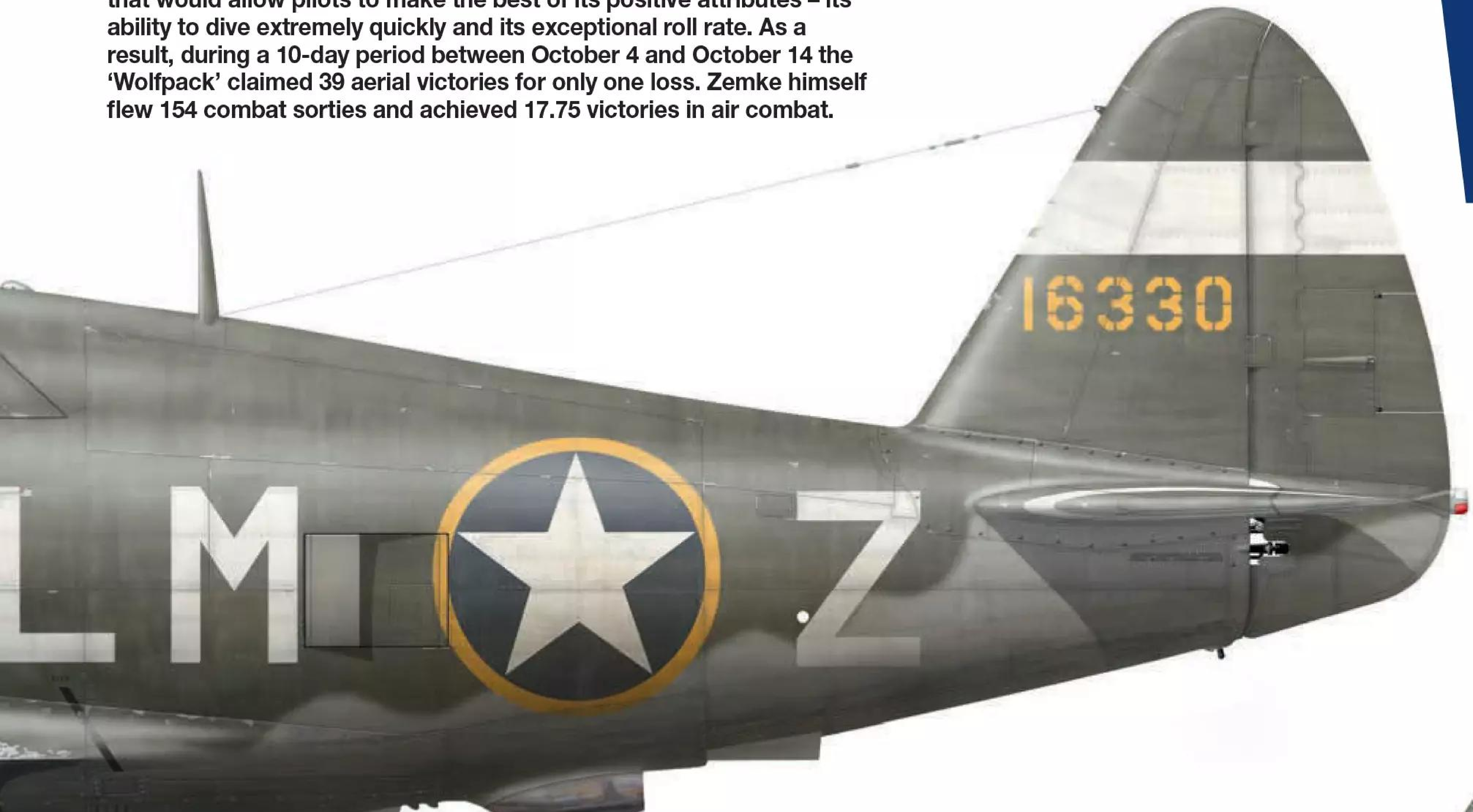
Preparing the SEV-7 for full production entailed further modifications, including the replacement of full mainwheel fairings with partial fairings

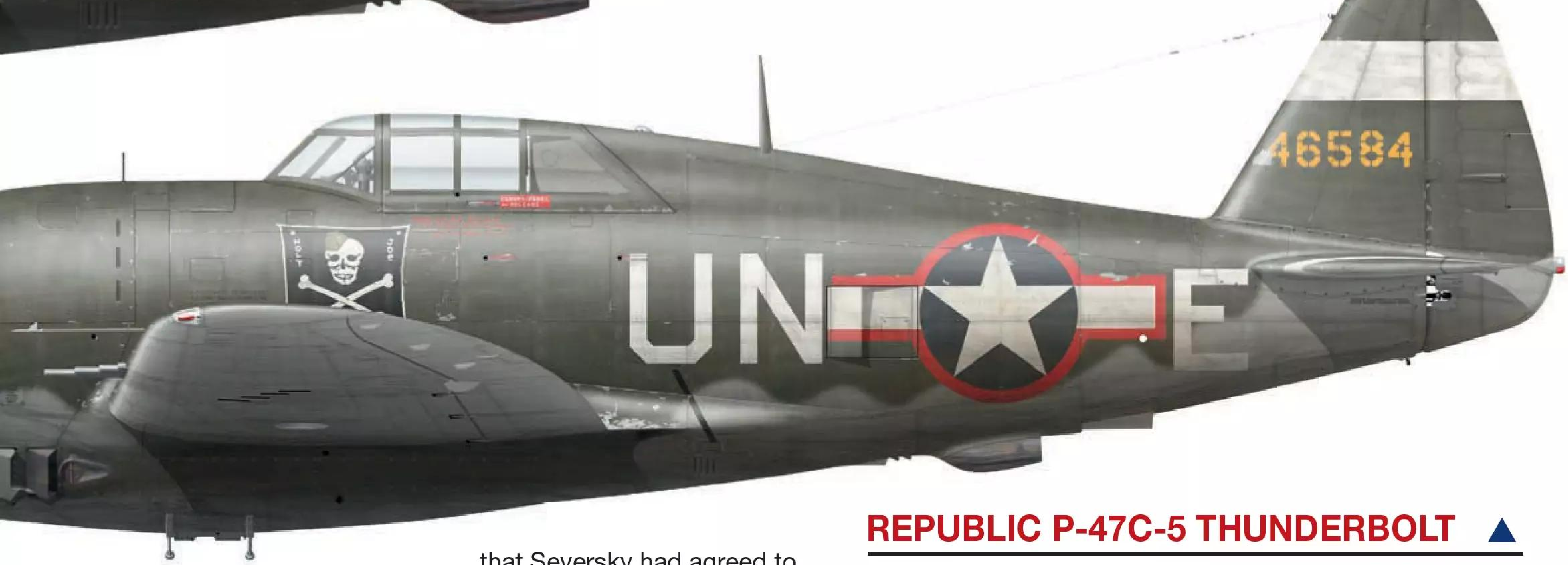


AMONG THE P-47'S ANCESTORS WAS A 1930S RACER

**REPUBLIC P-47C-5 THUNDERBOLT ▼**

**'My Comrade' was flown by Colonel Hubert Zemke, commanding officer of the 56th FG. During his stint as leader during the summer of 1943, the unit became known as 'Zemke's Wolfpack'. This is 'My Comrade' as seen at Horsham St Faith in England. Later in the war Zemke would transfer to a P-38 Lightning unit, which then converted to the P-51 – but the P-47 was the aircraft in which Zemke make his name. Unimpressed by the aircraft's slow rate of climb and poor acceleration when he first flew it, he set about developing tactics that would allow pilots to make the best of its positive attributes – its ability to dive extremely quickly and its exceptional roll rate. As a result, during a 10-day period between October 4 and October 14 the 'Wolfpack' claimed 39 aerial victories for only one loss. Zemke himself flew 154 combat sorties and achieved 17.75 victories in air combat.**





**REPUBLIC P-47C-5 THUNDERBOLT ▲**

**The skulls and crossbones painted on the side of Captain Joseph L Egan Jr's machine, shown here during September 1943, proved to be prophetic. The 63rd FS, 56th FG pilot was killed on July 19, 1944, when his P-47 crashed near St Avolt. He had five victories in air combat.**

and seven degrees of dihedral to the outer wing panels.

The Army Air Corps received its first full production P-35 in May 1937 and the last in August 1938. Concerned by the very slow delivery of its order, not to mention the fact that Seversky had agreed to sell the very similar two-seater SEV-2PA-B3 fighter-bomber to the Imperial Japanese Navy, the Army placed a much larger order with Curtiss for its P-36.

Seversky was determined to find more customers for the P-35, however, and converted the SEV-7 prototype into a single seat racer, the S-1, which it entered for the 1937 Bendix Trophy – finishing in fourth place. The competition was actually won by another P-35 derived racer built for a private customer, the S-2 made for Frank Fuller of the Fuller Paint Company. The S-2 came second in the 1938 Bendix Trophy and won it again in 1939. Further P-35 based racers were built for James Doolittle and the Shell Oil Company – the latter beating the S-2 to win the 1938 Bendix Trophy.

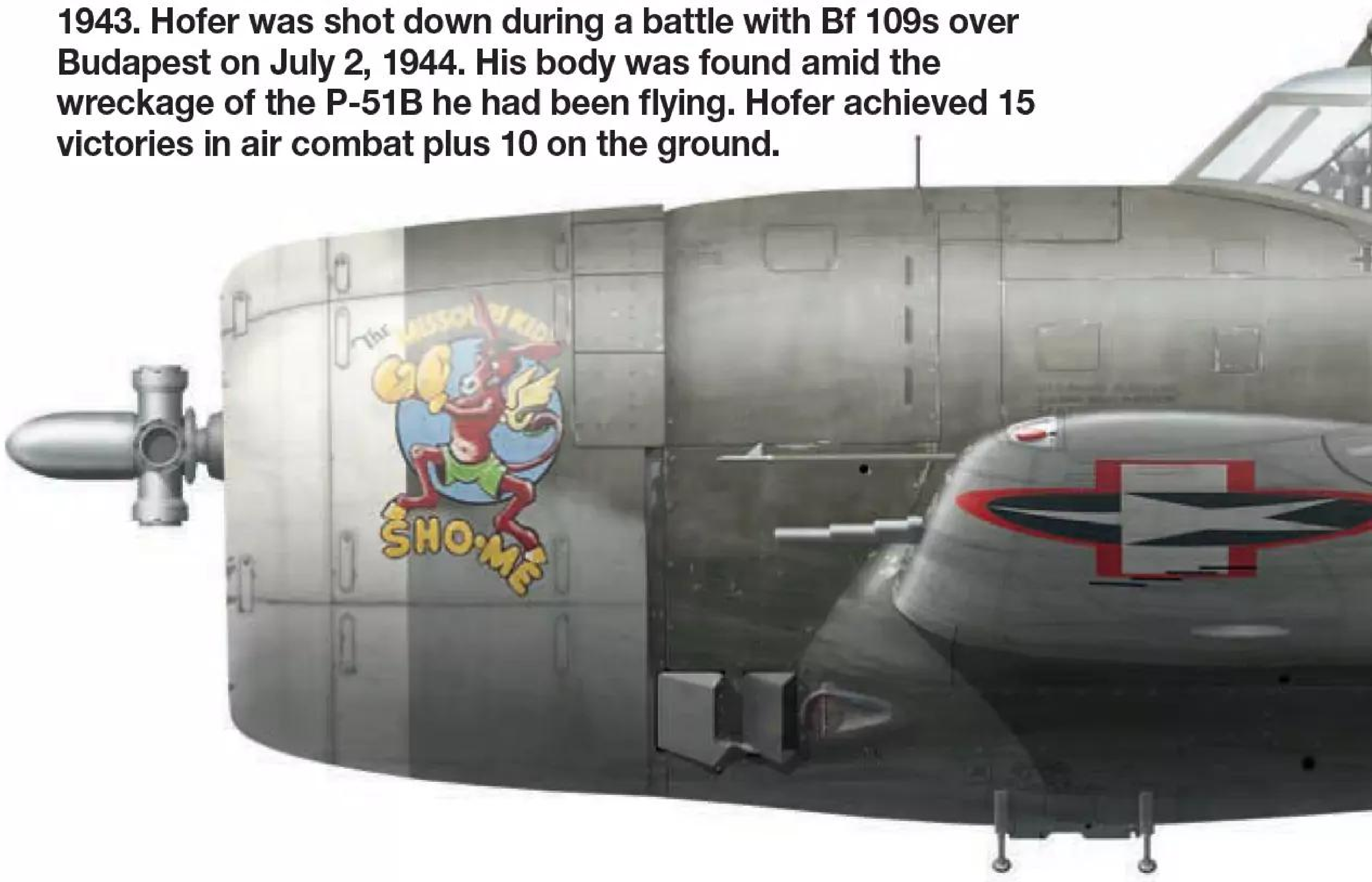
Buoyed by these successes, Seversky also built a range of private venture one-off P-35 variants with different engines and other modifications to try and attract more military customers: the AP-2, AP-4, AP-4D, AP-7 and AP-9.

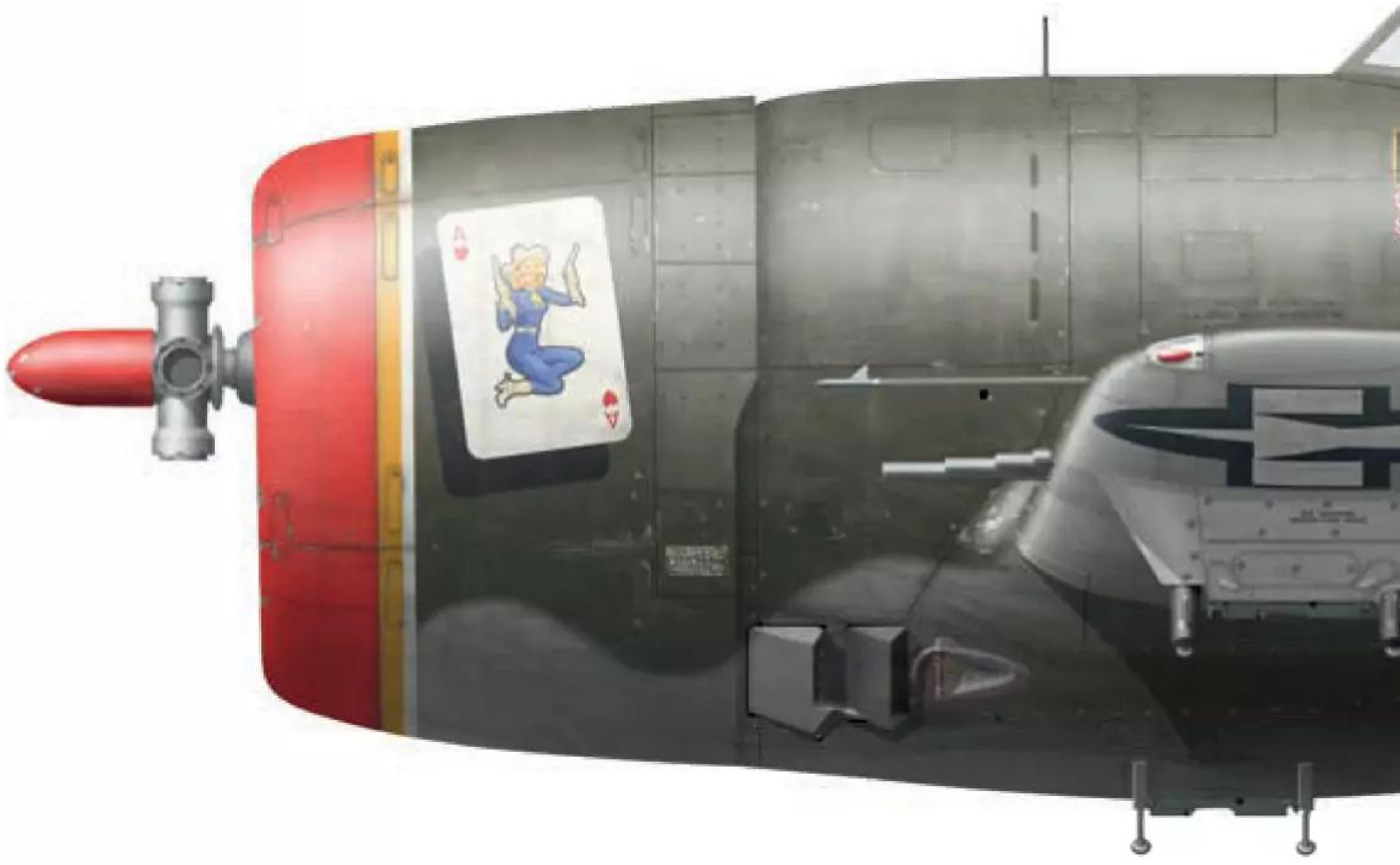
The AP-4 and AP-4D were the designs that initially caught the attention of the Air Corps, the AP-4D first being flown in March 1939. It had been modified from the last production model P-35 with the addition of a long streamlined glazed canopy and a Pratt & Whitney R-1830-19 engine with two-speed supercharger. The landing gear was also revised. The Army gave it the provisional designation XP-41.

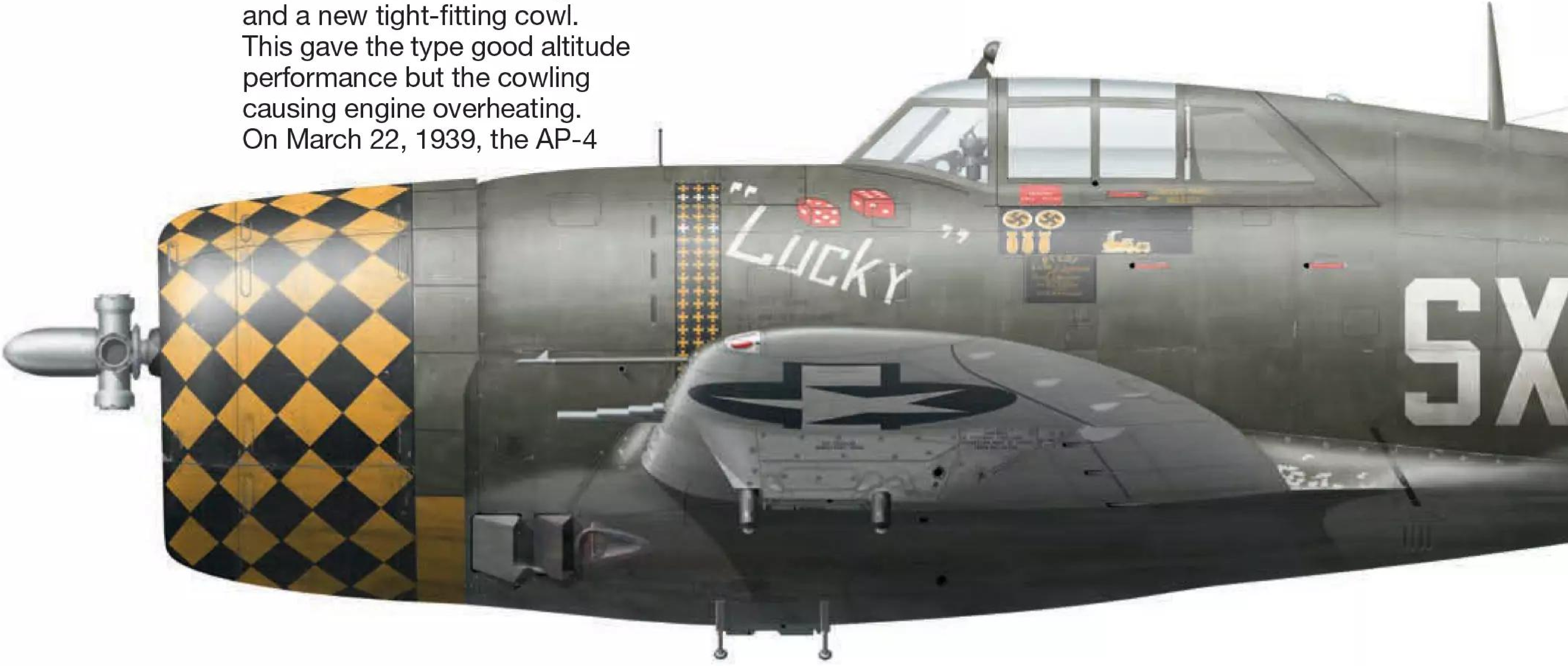
The AP-4 was another P-35 derivative but had been built from scratch. It was powered by a Pratt & Whitney R-1830-SC2G, fitted with a belly-mounted turbo-supercharger and a new tight-fitting cowl. This gave the type good altitude performance but the cowling causing engine overheating. On March 22, 1939, the AP-4

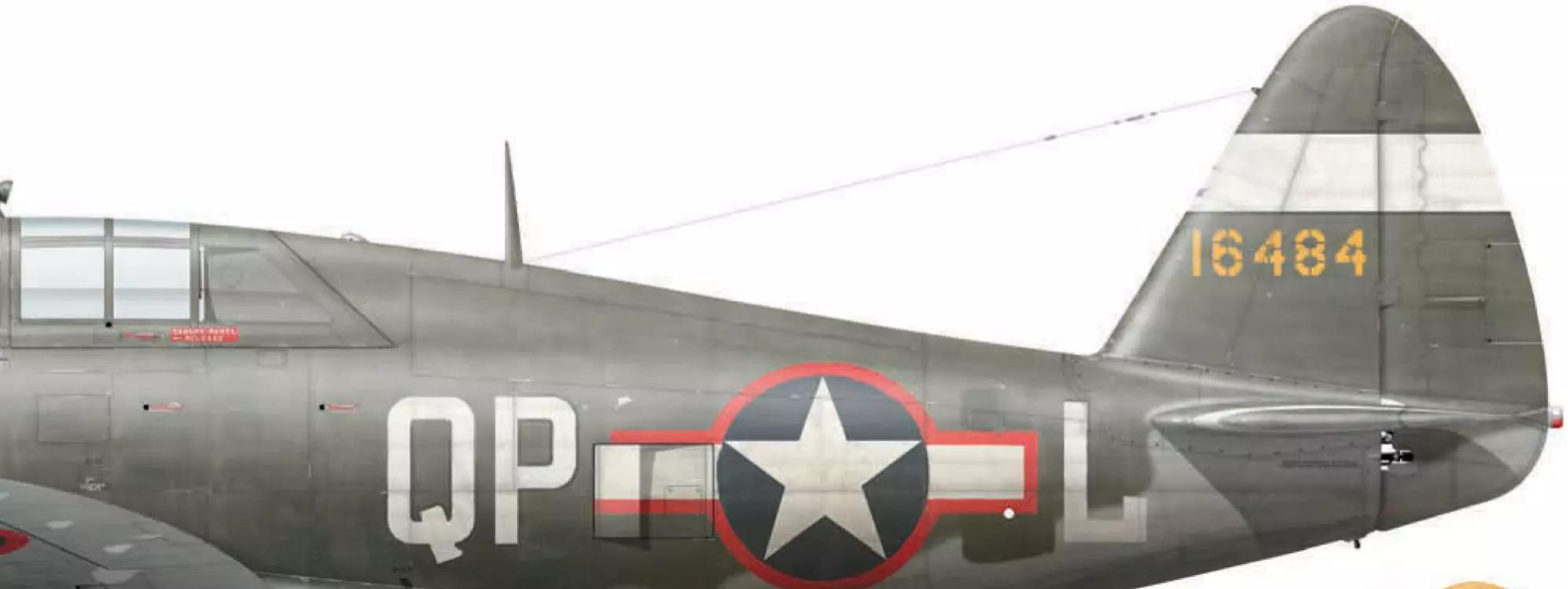
## REPUBLIC P-47C-5 THUNDERBOLT

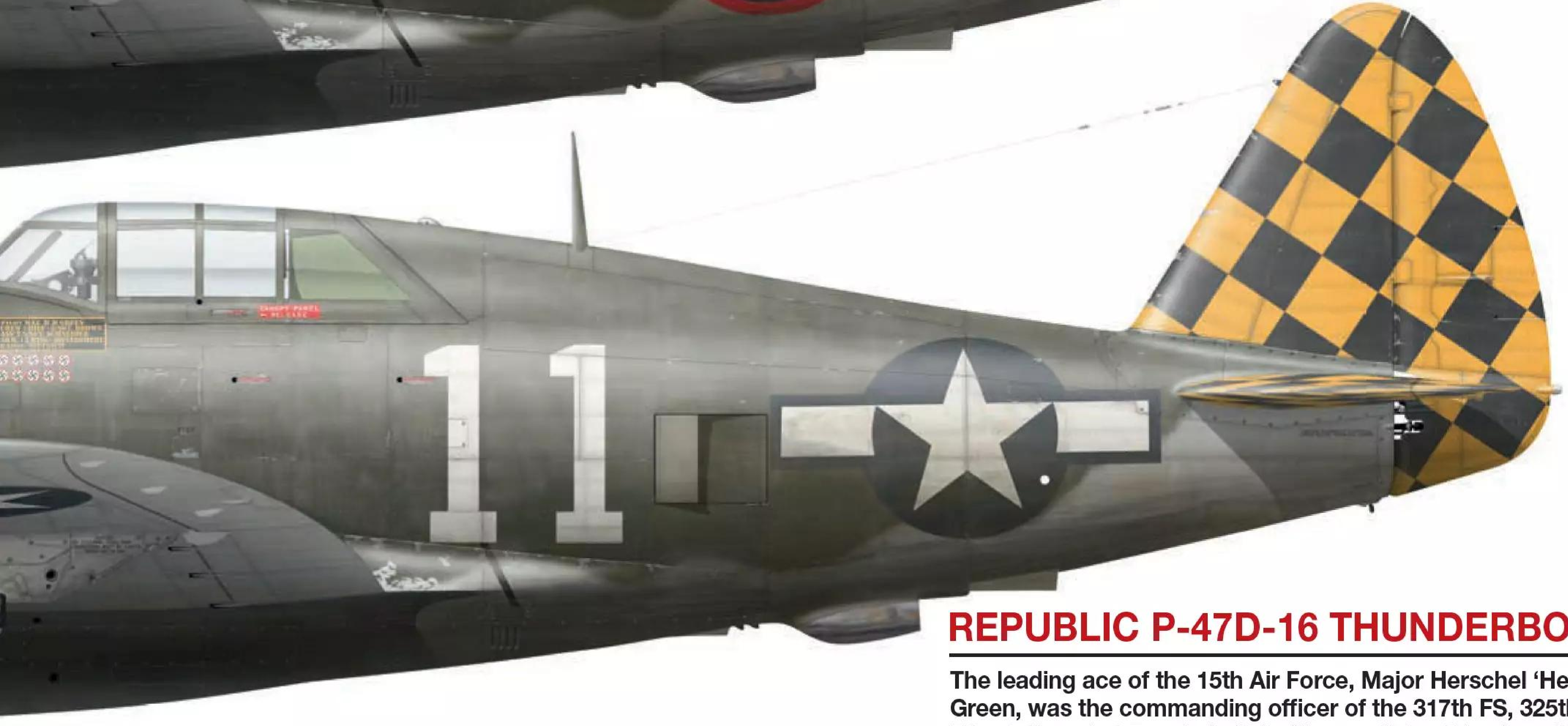
**Notorious for failing to maintain radio discipline, 1st Lieutenant Ralph K 'The Kid' Hofer flew with the 334th FS, 4th FG, based at Debden in England. This was his aircraft circa October 1943. Hofer was shot down during a battle with Bf 109s over Budapest on July 2, 1944. His body was found amid the wreckage of the P-51B he had been flying. Hofer achieved 15 victories in air combat plus 10 on the ground.**





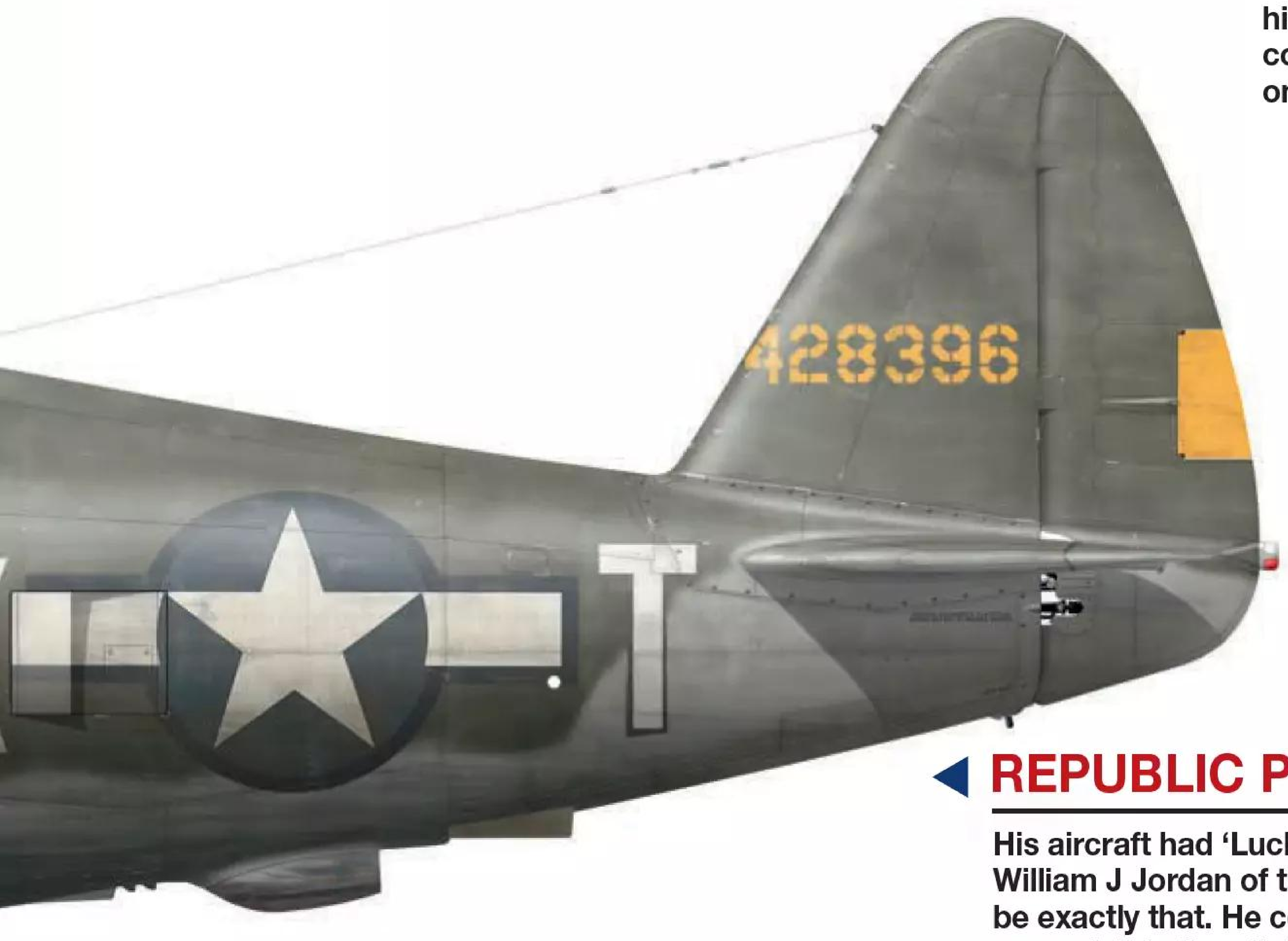






## REPUBLIC P-47D-16 THUNDERBOLT

The leading ace of the 15th Air Force, Major Herschel 'Herky' Green, was the commanding officer of the 317th FS, 325th FG, stationed at Foggia in Italy. He was flying this aircraft with his cowgirl 'ace' art during March 1944. Overall, he flew 100 combat sorties and achieved 18 victories in air combat plus 10 on the ground. He survived the war and died in 2006 aged 86.



## REPUBLIC P-47D-5 THUNDERBOLT

His aircraft had 'Lucky' on its nose and 1st Lieutenant William J Jordan of the 352nd FS, 353rd FG, proved to be exactly that. He completed his tour of duty then did a second, this time flying the P-51. He eventually went home safely with one and a half aerial victories. The aircraft is show as it appear at Raydon in England during April 1944.

prototype caught fire and the pilot was forced to bail out. Nevertheless, its performance had been sufficient to convince the Army to order another 13 in May 1939 under the designation YP-43 Lancer. Work on the parallel XP-41 development was stopped.

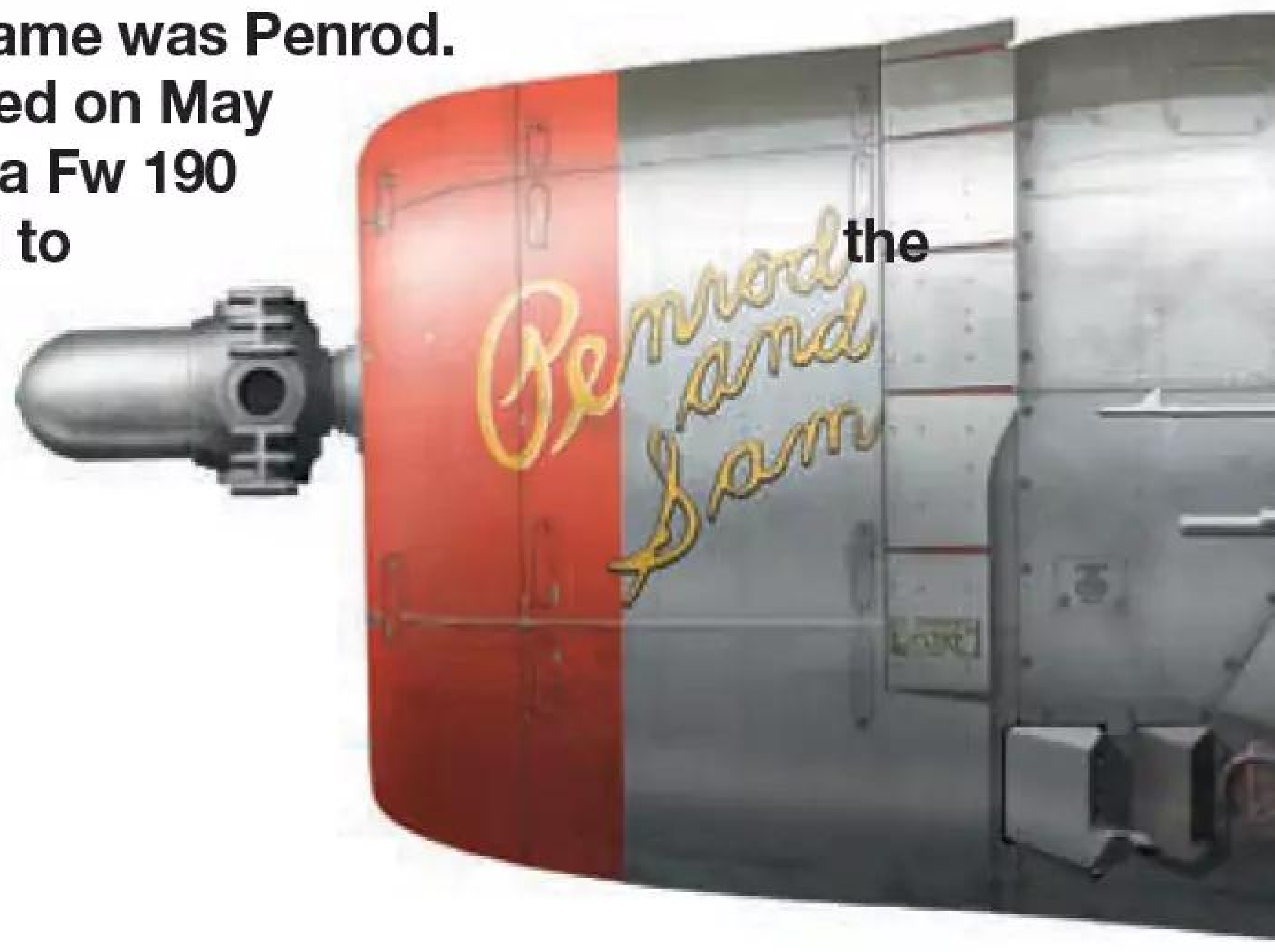
The YP-43 differed from the XP-41 in having a smaller cockpit which melded into a tall fuselage spine or 'razorback'. The engine's air intake was repositioned from beneath the port wing to directly under the engine, giving it a distinctively ovoid cowling. Its turbo-supercharged R-1830-35 radial engine drove a three-bladed variable pitch propeller and it had two .50 cal machine guns positioned above the engine plus a .30 cal in each wing.

In October 1939, the Seversky Aircraft Company was reorganised as the Republic Aviation Corporation and its charismatic founder, Alexander de Seversky was effectively ousted while he was away on a business trip in Europe.

As preparations were being made to produce the short-run YP-43, Republic was working up yet another P-35 derivative – the AP-10. This was to be a

## REPUBLIC P-47D-21 THUNDERBOLT ▼

**Major Robert S Johnson of the 62nd FS, 56th FG was the top-scoring P-47 ace of the Second World War with 27 victories in air combat from 89 sorties. This is his last aircraft, 'Penrod and Sam', at Boxted in England during May 1944. A boys' novel about best friends penned by Booth Tarkington in 1916, Penrod and Sam was made into a film in 1937; and it happened that Johnson's own middle name was Samuel while his crew chief's surname was Penrod. Johnson's final victories were scored on May 8 when he shot down a Bf 109 and a Fw 190 over Celle in Germany. He returned to the US on June 6, 1944 – D-Day.**

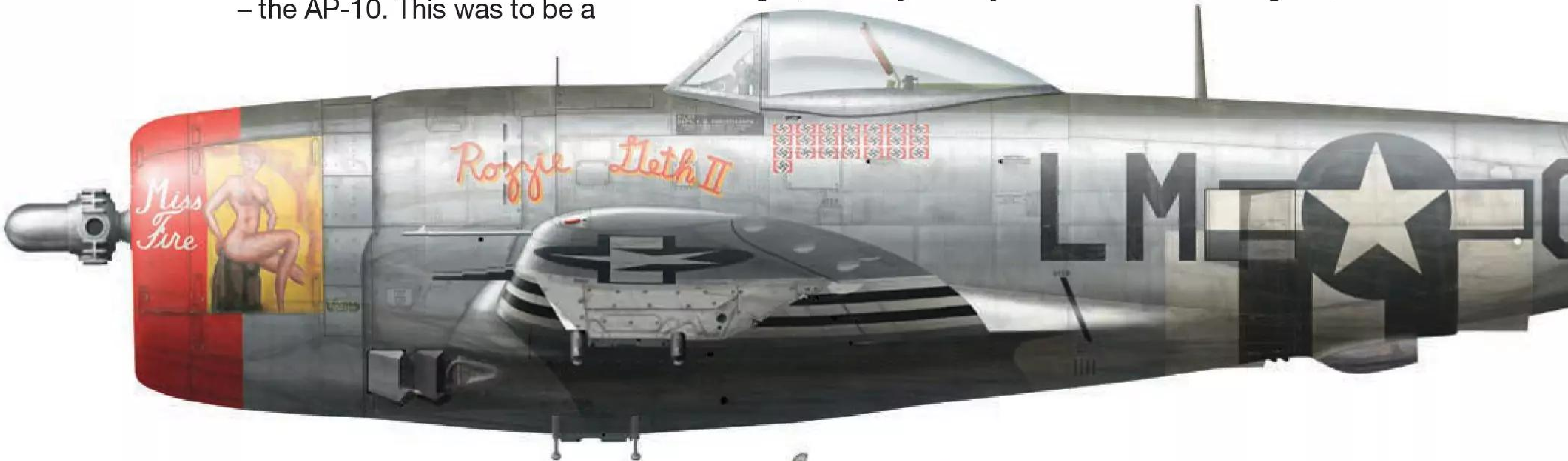


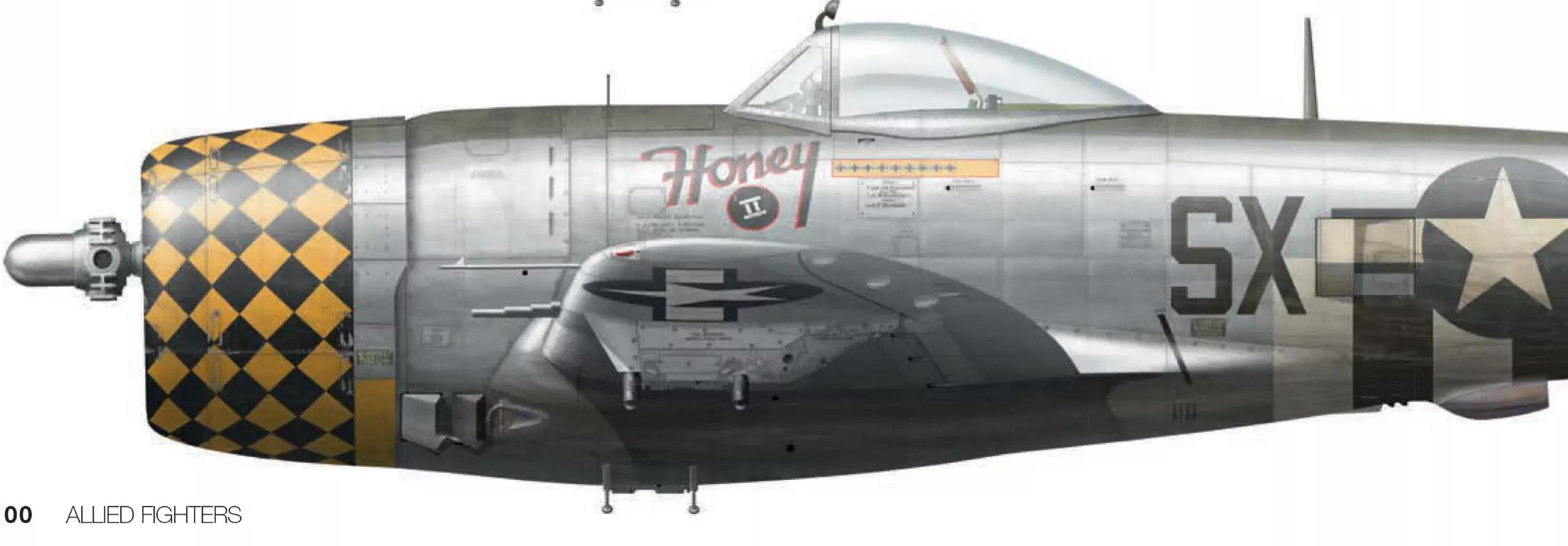
## REPUBLIC P-47D-22 THUNDERBOLT ▶

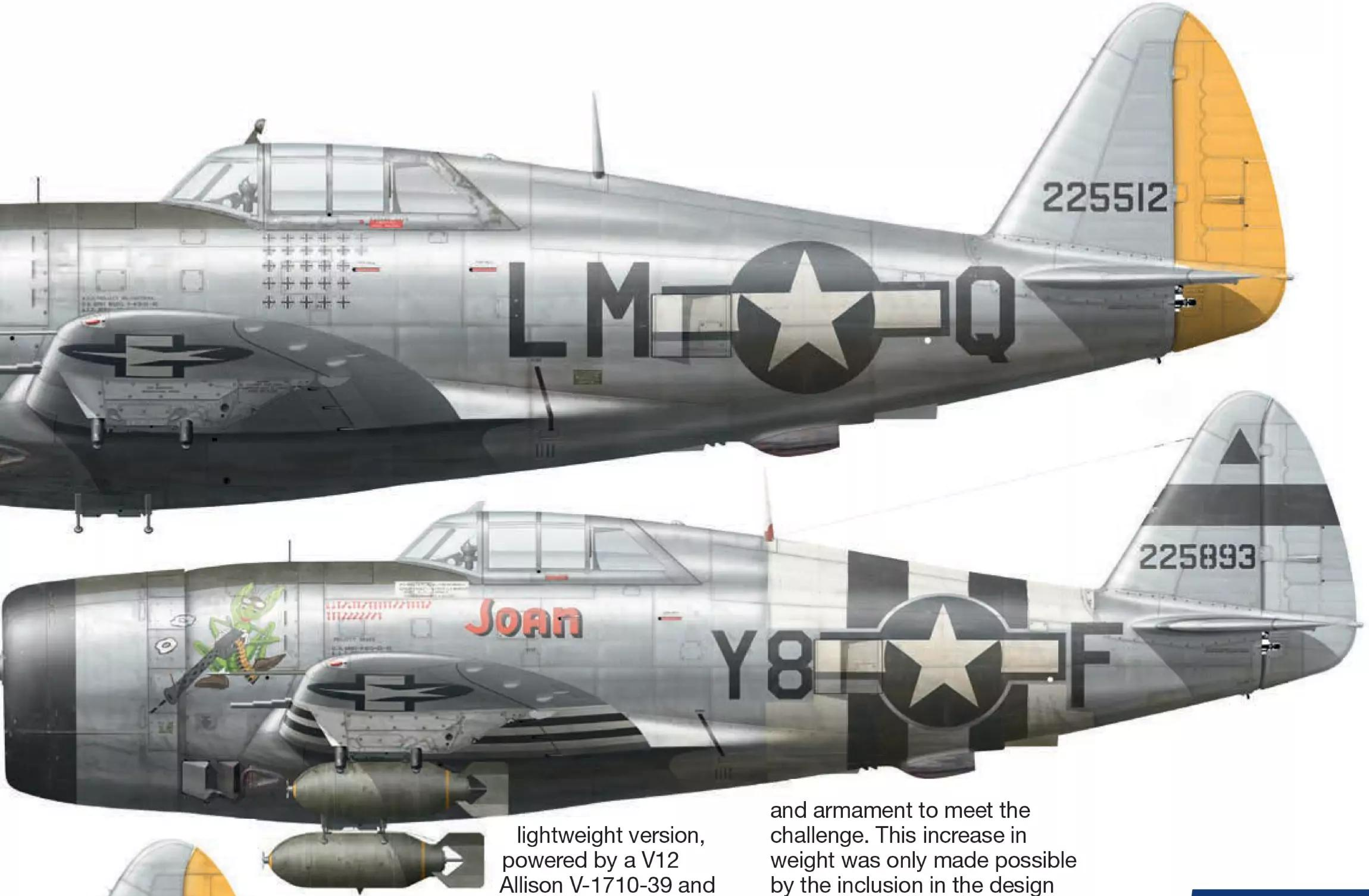
**'Joan the Happy Hopper' was flown by 1st Lieutenant Russel S Fredendall of the 507th FS, 404th FG, based at Wington, England, during early June 1944.**

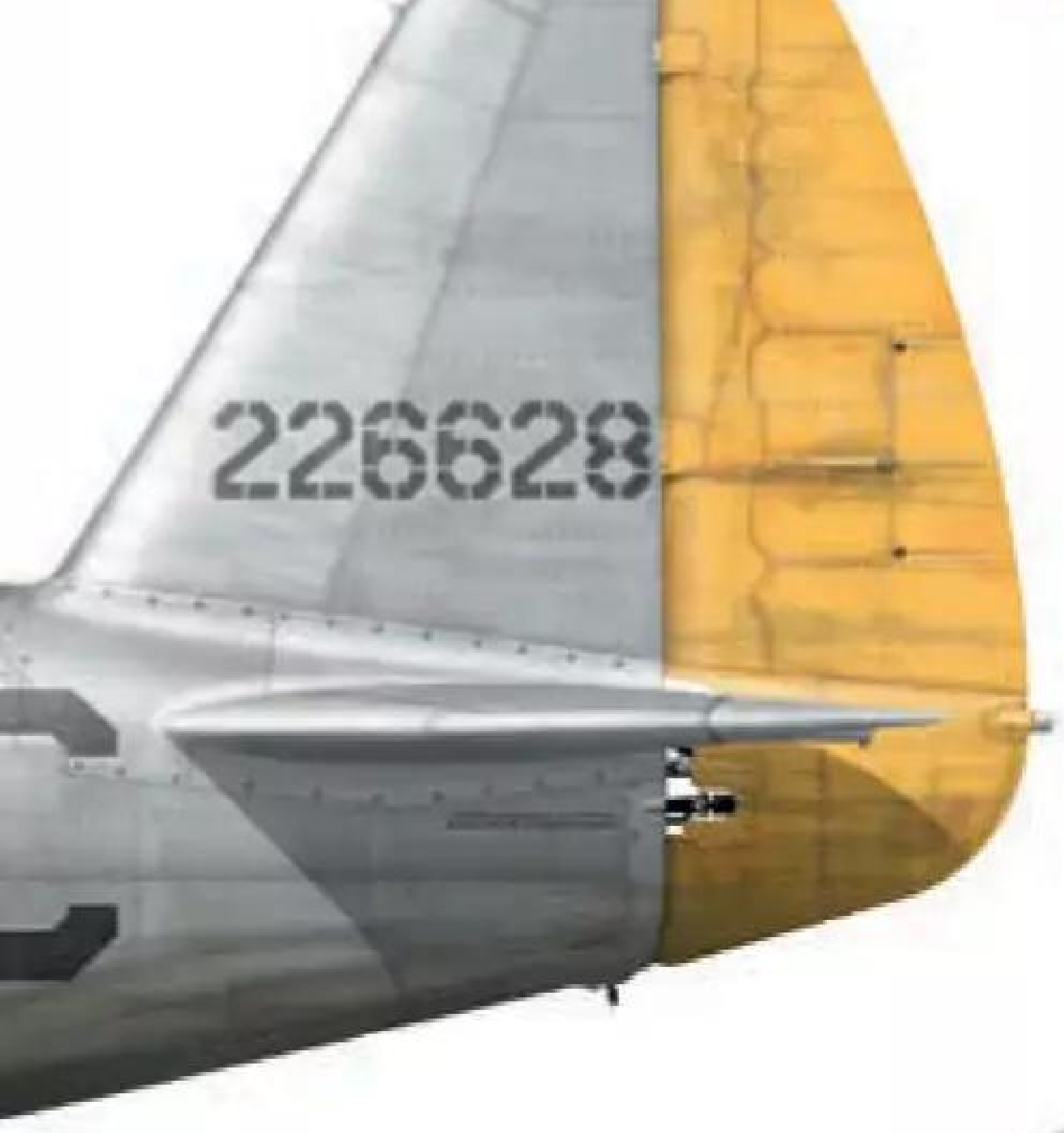
## REPUBLIC P-47D-25 THUNDERBOLT ▼

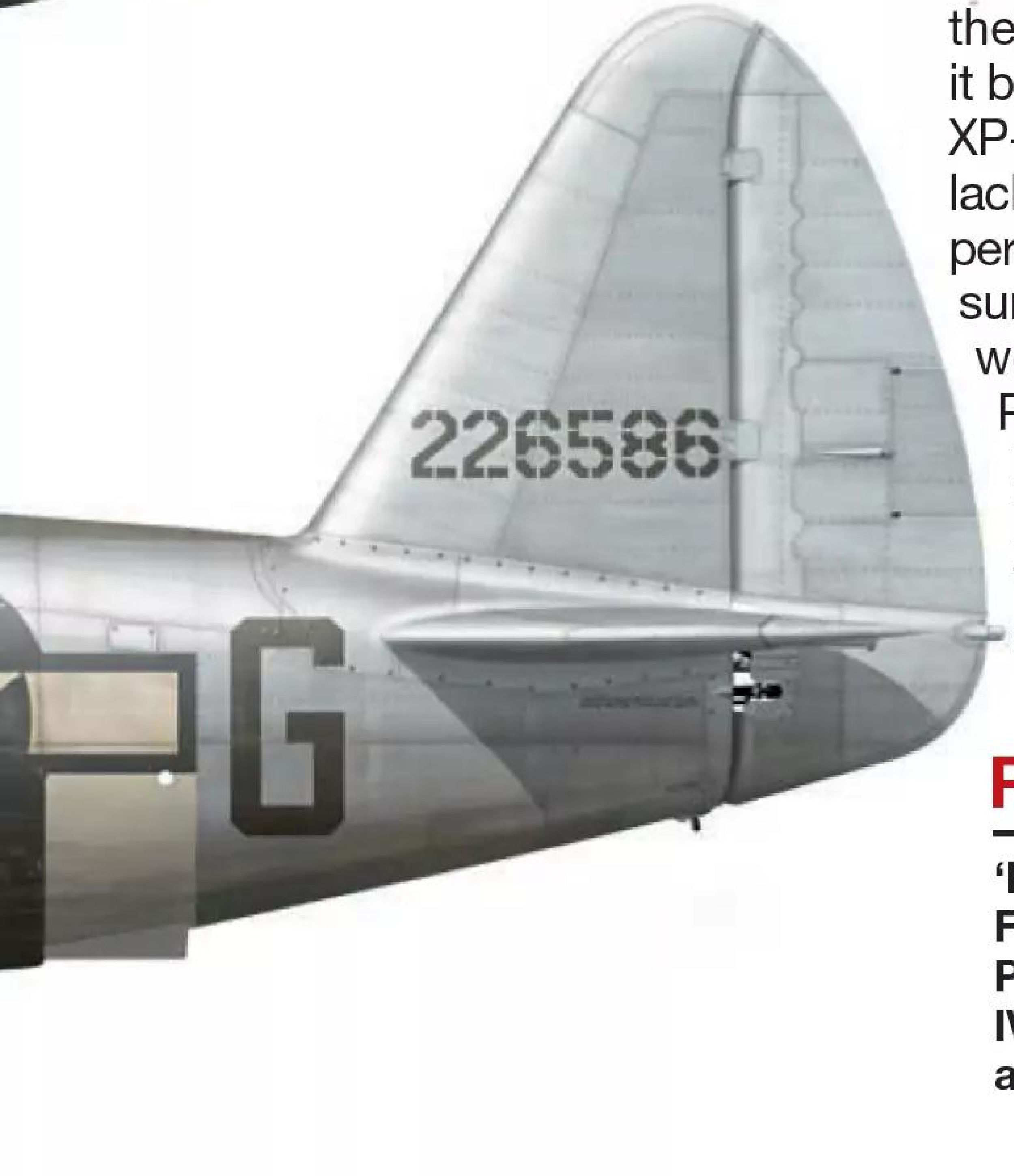
**Captain Fred J Christensen Jr of the 62nd FS, 56th FG, based at Boxted, England, gave his aircraft two names – 'Miss Fire' complete with raunchy nude, and 'Rozzie Geth II' as a short form of his college sweetheart's name, Rosamund Gethro. He was flying it on July 5, 1944, when he made his last fighter kill of the war, a Fw 190 over Beziers in France. He rounded off his score at 21.5 overall with the addition of no fewer than six Ju 52 transports over Gardelegen, Germany two days later. He died in 2006 aged 84.**











lightweight version, powered by a V12 Allison V-1710-39 and armed with eight .50 cal Browning machine guns. The Army was interested enough to give this new development the designation XP-47 and to order a prototype in November 1939, plus a prototype of a further lightened design, the XP-47A.

However, as the Battle of Britain unfolded in Europe during the summer of 1940 and combat reports made their way back to the US, it became evident that the XP-47 and XP-47A would lack the necessary armour, performance and weaponry to survive in a dogfight and both were cancelled. Therefore, Republic designer Alexander Kartveli came up with a larger, heavier version of the design that could carry all the necessary armour and armament to meet the challenge. This increase in weight was only made possible by the inclusion in the design of the new Pratt & Whitney R-2800 Double Wasp two-row 18-cylinder radial engine, which produced an incredible 2000hp.

Delivery of the 13 Republic YP-43s began in September 1940 and production was eventually extended to 272 examples but Republic now focussed much more of its attention on the new Double Wasp-powered design, which had been given the designation XP-47B even though it actually had little in common with the XP-47A.

The XP-47B was all-metal except for fabric coverings on its tail control surfaces. Its wings were elliptical in shape with a slightly swept leading edge. The cockpit was air-conditioned and spacious with a comfortable seat and canopy doors that

THE P-47 NEEDED A DEEP FUSELAGE TO HOUSE ITS TURBO-SUPERCHARGER

## REPUBLIC P-47D-25 THUNDERBOLT ◀

**'Honey II' was flown by Captain James N Poindexter of the 352nd FS, 353rd FG, based at Raydon in England during August 1944. Poindexter was killed when his personal aircraft at the time, 'Honey IV', a P-51, crashed at Capel St Mary, Suffolk, on January 3, 1945. He achieved seven victories in air combat plus four on the ground.**

hinged upwards. Self-sealing fuel tanks beneath the cockpit could hold 305 US gallons.

The R-2800 engine drove a four-bladed propeller and was housed within a broad cowling which admitted air for the engine itself, the oil coolers and the turbo-supercharger intercooler system. This involved engine exhaust gases entering a pair of wastegate-fitted pipes which ran along the sides of the cockpit to drive the turbo-supercharger turbine about halfway between the cockpit and the tail at the bottom of the fuselage. This ducting resulted in the XP-47B having a very deep fuselage and the wings needing to be mounted relatively high up. Consequently, the aircraft needed long undercarriage legs.

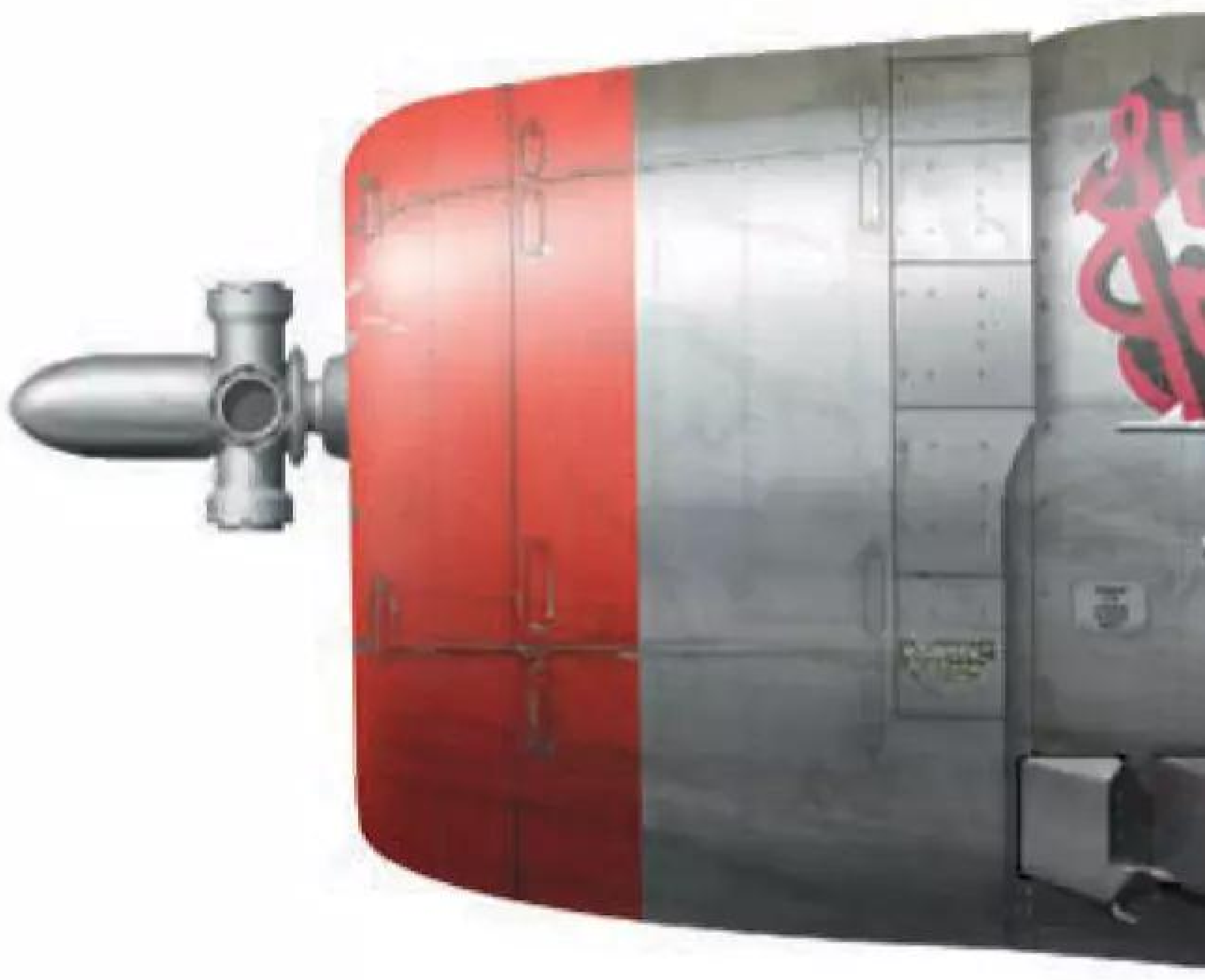
It was armed with eight .50 cal machine guns – four per wing, staggered so that their ammunition boxes would have sufficient space. The XP-47B's first flight was on May 6, 1941, and after initial tests the type managed an impressive top speed of 412mph at 25,800ft.

As with most new designs, the type threw up a number of teething problems – it needed a long runway to take off, the tightly packed machine guns in the wings often jammed, control loads were excessive at high speed, the cockpit covers had a disturbing tendency to jam and the aircraft lacked the manoeuvrability of contemporary types such as the Bf 109 or Spitfire.

Even so, the USAAF ordered 171 P-47Bs and the first production example was delivered in May 1942. The canopy problem was cured with the introduction of a rearwards-sliding version which could be ejected in an emergency and the fabric covered control surfaces were replaced with all-metal construction.

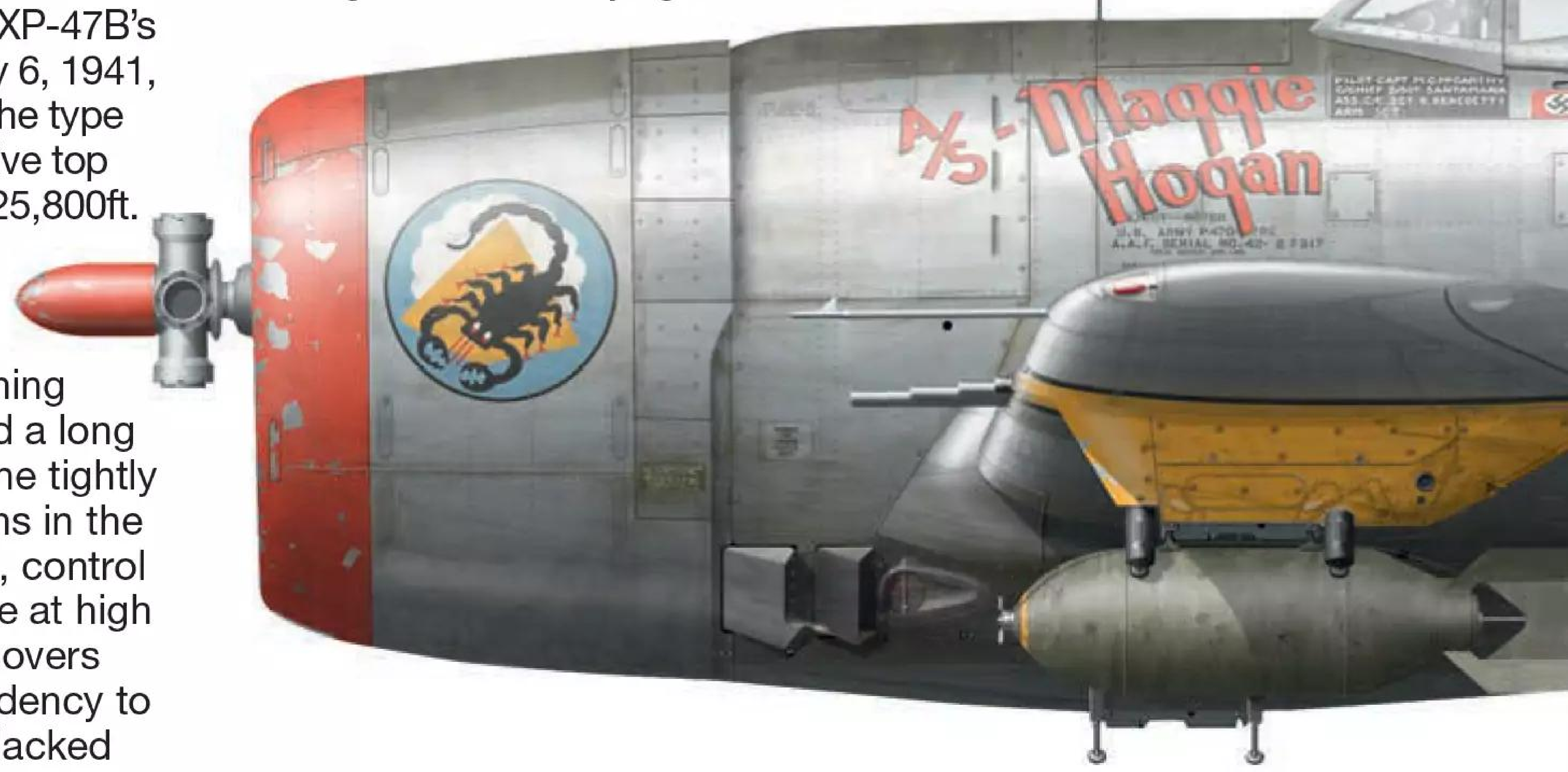
As Republic reworked its design and continued to make improvements, the USAAF's confidence in the P-47 Thunderbolt grew and an order for a further 602 examples was placed. Embodying numerous detail changes, such as an upgraded General Electric turbo-supercharger regulator

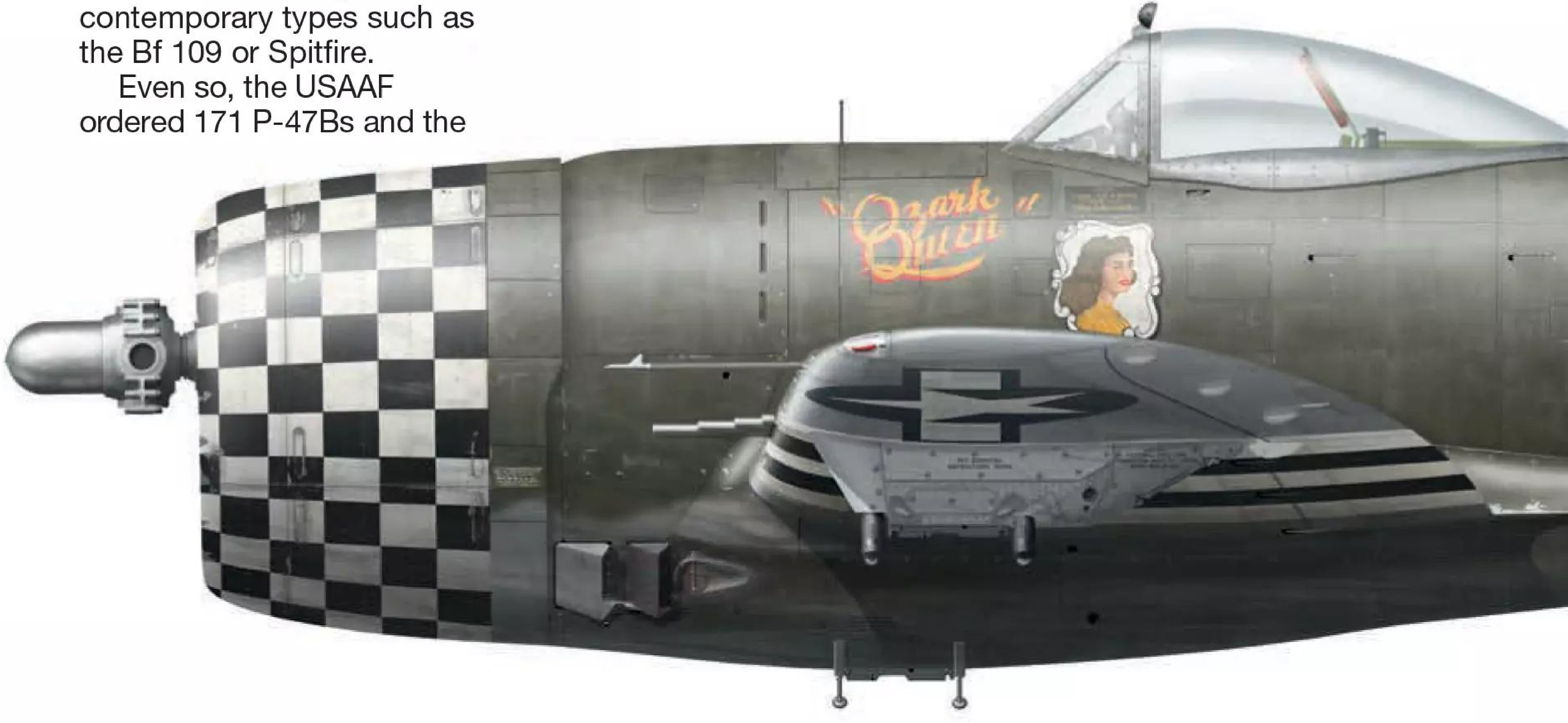
P-47S STARTED TO ARRIVE IN ENGLAND DURING EARLY 1943



## REPUBLIC P-47D-27 THUNDERBOLT

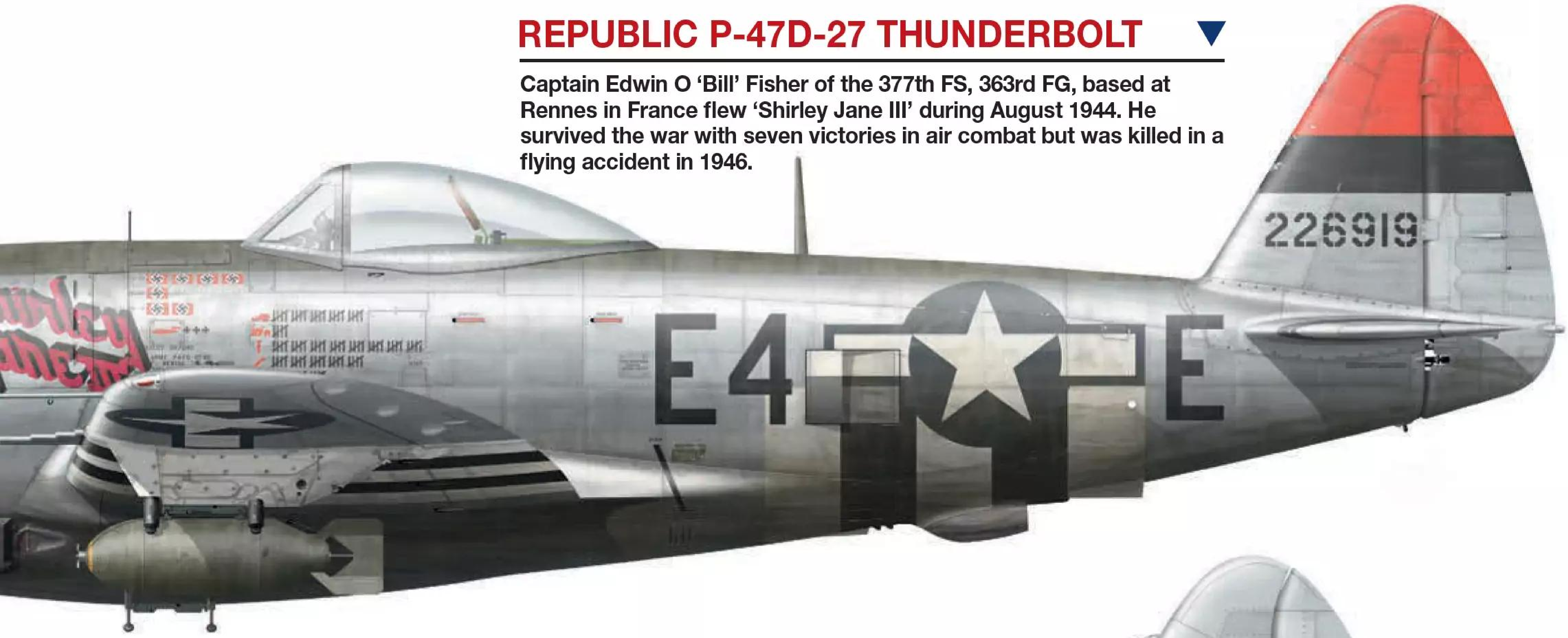
**Scoring one victory in air combat from 154 combat sorties, Captain Michael C McCarthy of the 64th FS, 57th FG, was based at Grosseto in Italy during September 1944 when he flew 'Maggie Hogan'. His air-to-air record belies the fact that most of his missions were flown against ground targets during the Italian campaign.**

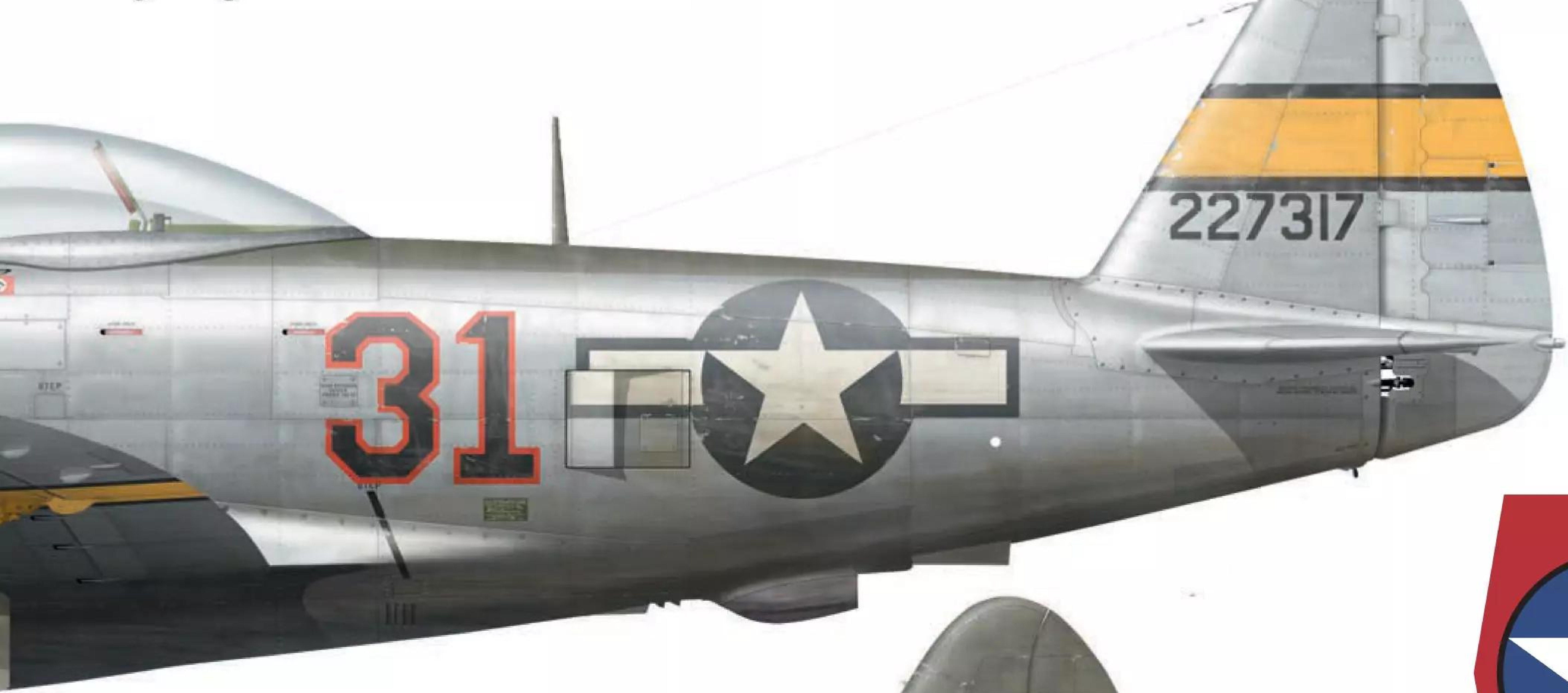


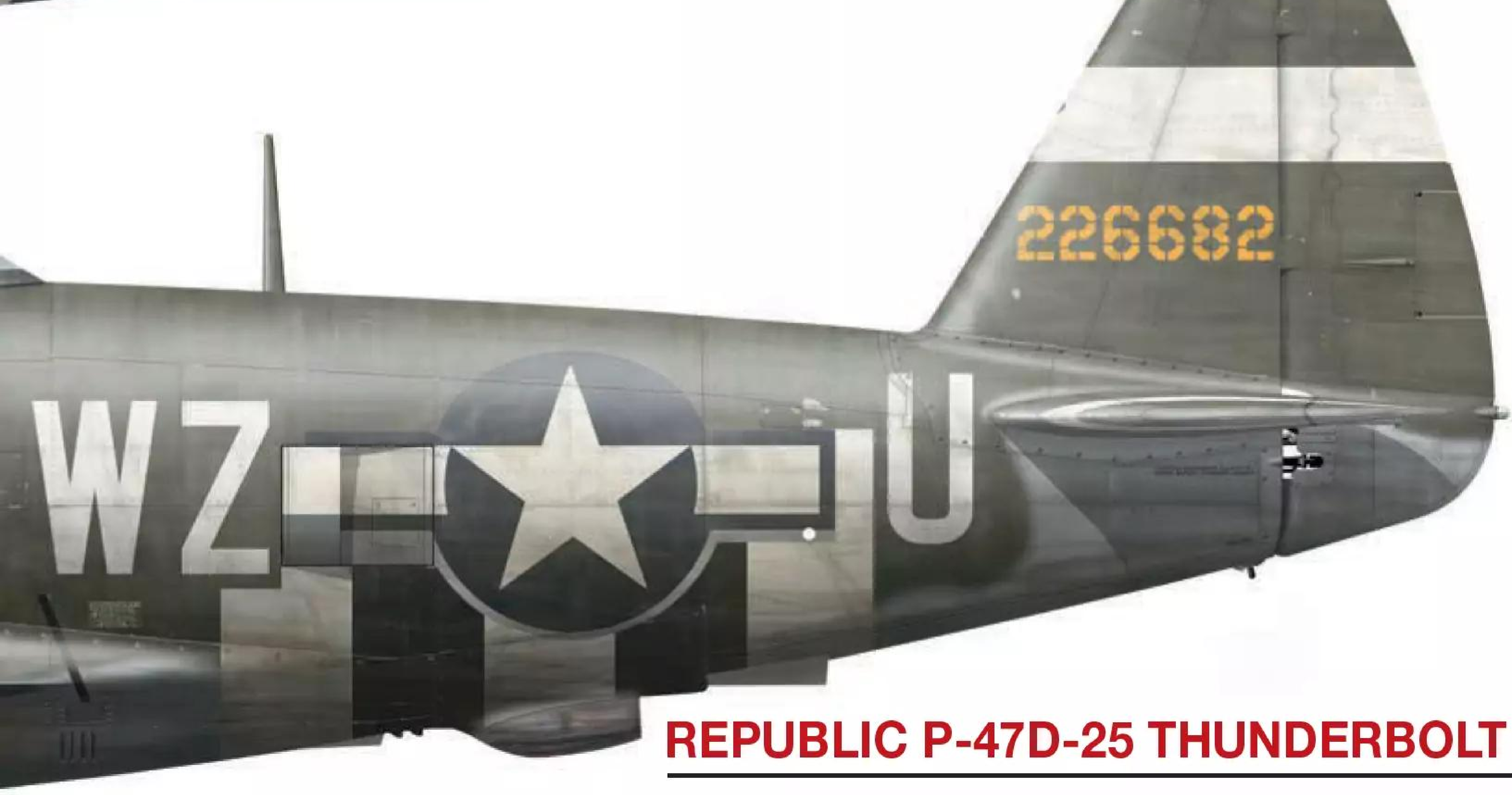


## REPUBLIC P-47D-27 THUNDERBOLT ▼

Captain Edwin O 'Bill' Fisher of the 377th FS, 363rd FG, based at Rennes in France flew 'Shirley Jane III' during August 1944. He survived the war with seven victories in air combat but was killed in a flying accident in 1946.







## REPUBLIC P-47D-25 THUNDERBOLT ▲

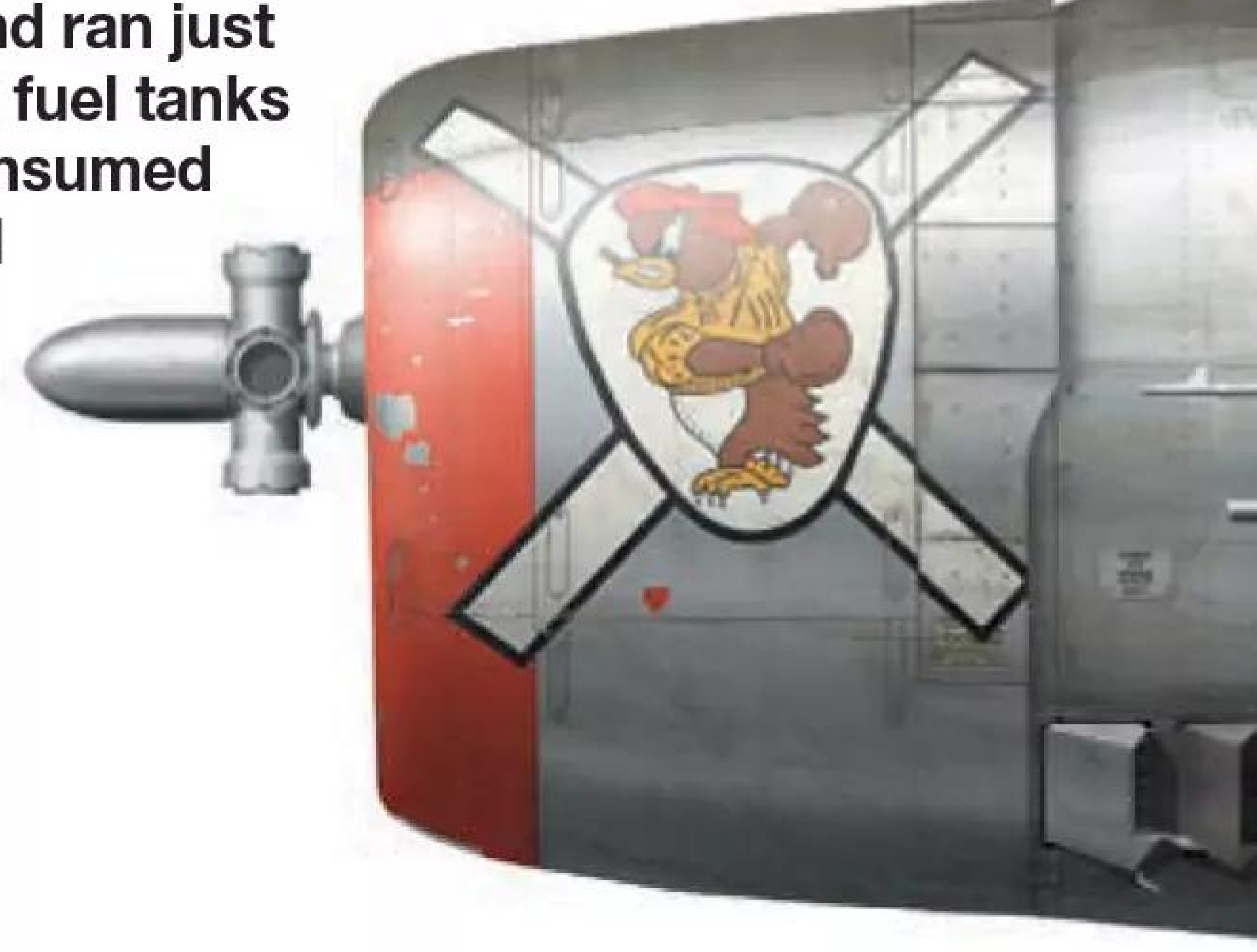
'Ozark Queen' was flown by Captain Alfred F Eaton of the 84th FS, 78th FG, based at Duxford, England, during September 1944. His aircraft is relatively well known today, thanks to some nice photographs taken at the time. Before his tour of duty ended on November 29, 1944, he damaged a Bf 109 in the air on July 1, 1944, and destroyed both a Do 217 and a Me 410 on July 19 that year.

and a short vertical radio mast, these were designated P-47C and deliveries commenced in September 1942.

With the 58th P-47C, the production line was altered to include an 8in fuselage extension forward of the cockpit to alter the type's centre of gravity and allow improved access for engine maintenance. The oil cooler exhausts were changed and

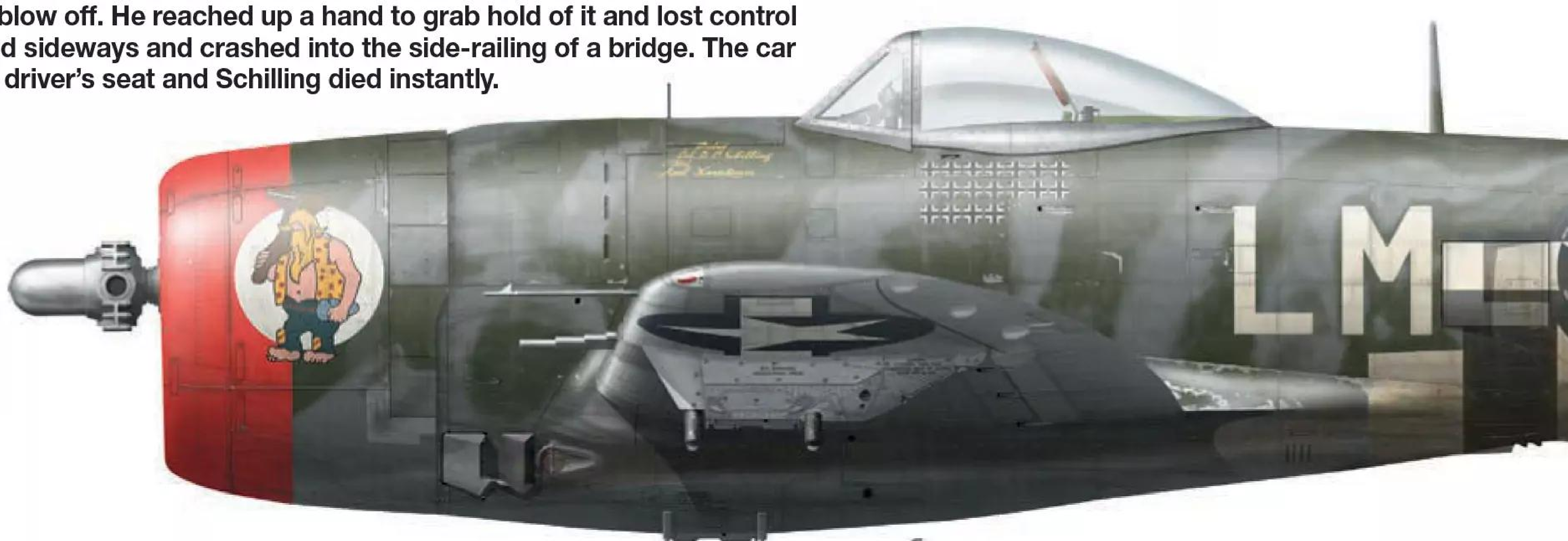
## REPUBLIC P-47D-26 THUNDERBOLT ▶

**This is how 'Toots', flown by Lieutenant Joseph Angelone of the 66th FS, 57th FG, based at Grosseto, Italy, looked on October 6, 1944. The following day, while setting out on his next mission, one of the aircraft's tyres blew out at 100mph on take-off. The fully-laden 'Toots' wasn't moving fast enough to get airborne and slewed into a mound of earth beside the runway. The right main undercarriage leg snapped and the wingtip hit the ground, causing the aircraft to be upended. Angelone jumped from the cockpit and ran just in time as the fuel leaking from its full fuel tanks ignited – resulting in a fireball that consumed 'Toots' completely. Angelone suffered only bruises.**

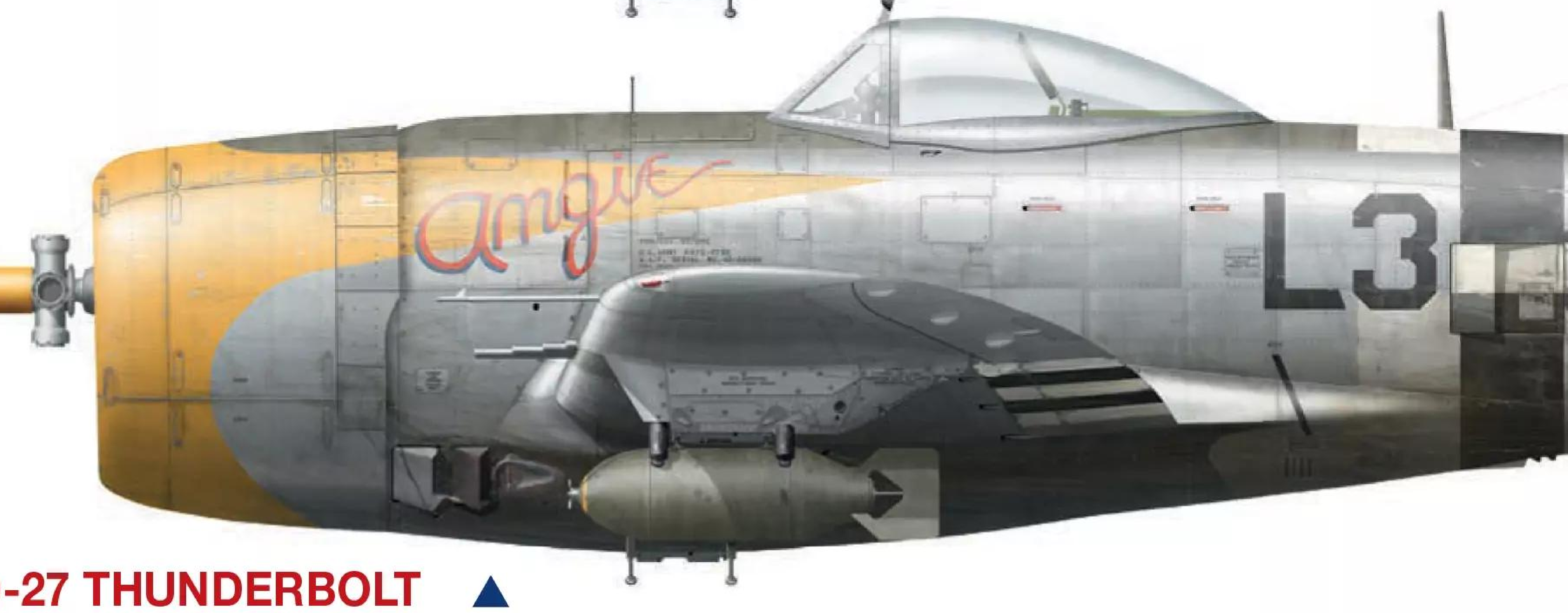


## REPUBLIC P-47D-25 THUNDERBOLT ▼

**When Hubert Zemke left the 56th FG, his replacement as commanding officer was Lieutenant Colonel David C Schilling. This is his aircraft 'Hairless Joe' at Leavenworth, England, during October 1944. Schilling flew 132 combat sorties and scored 22.5 victories in air combat. He remained with the air force after the war and by 1956 was inspector general in Strategic Air Command's Seventh Air Division. He was also a fast car enthusiast and owned an open-topped Cadillac/Allard machine like his friend General Curtis LeMay and others who formed a group for Sports Car Club of America events. On August 14, 1956, Schilling was driving at high speed down a narrow two lane country road in Suffolk, approaching the rear of a slower vehicle he intended to overtake. At this point, his cap began to blow off. He reached up a hand to grab hold of it and lost control of the car, which skidded sideways and crashed into the side-railing of a bridge. The car was sliced in half at the driver's seat and Schilling died instantly.**



THE P-47D WAS THE MOST PRODUCED VERSION

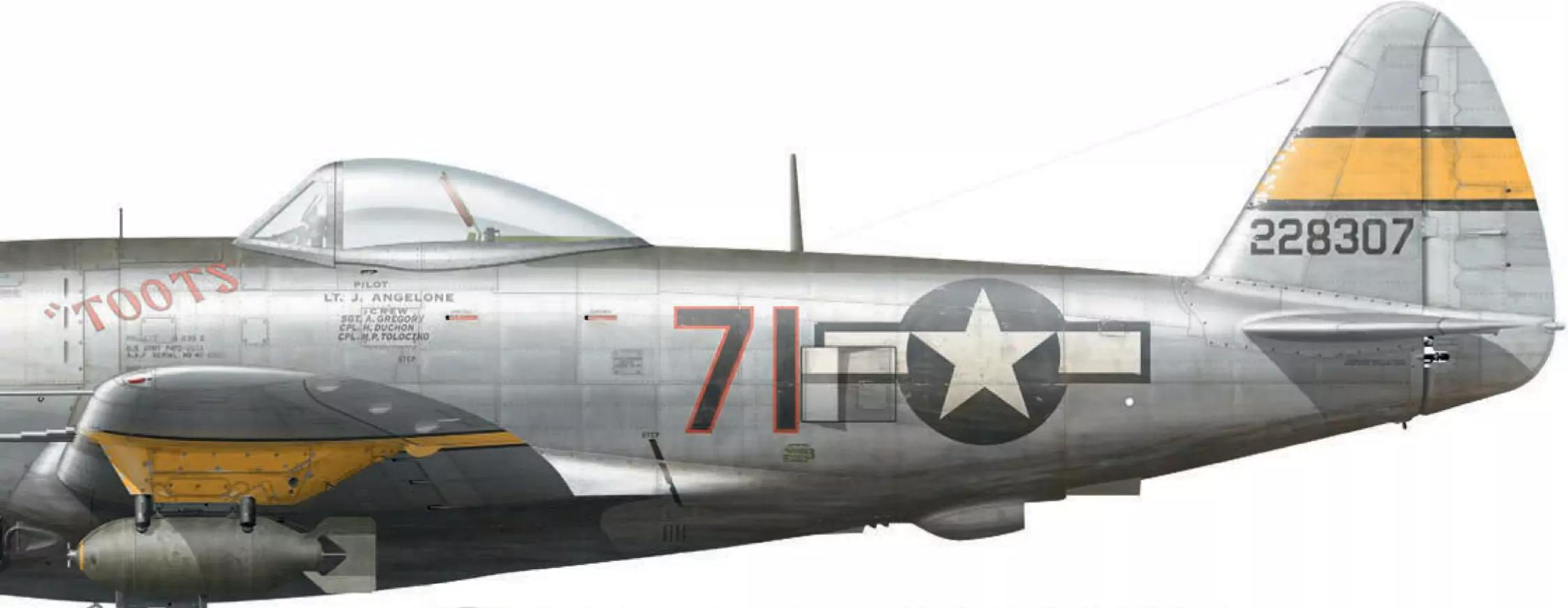


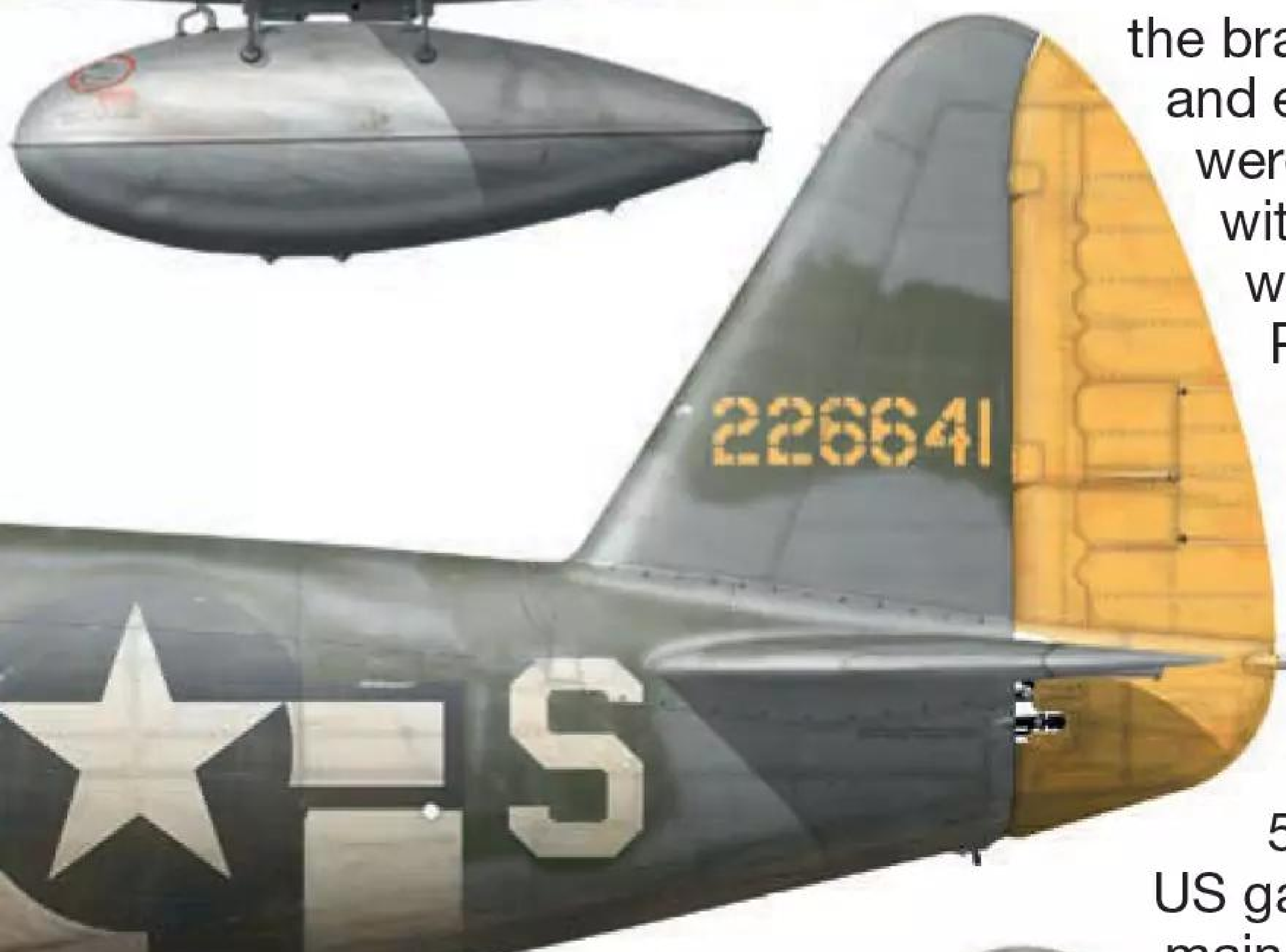
## REPUBLIC P-47D-27 THUNDERBOLT ▲

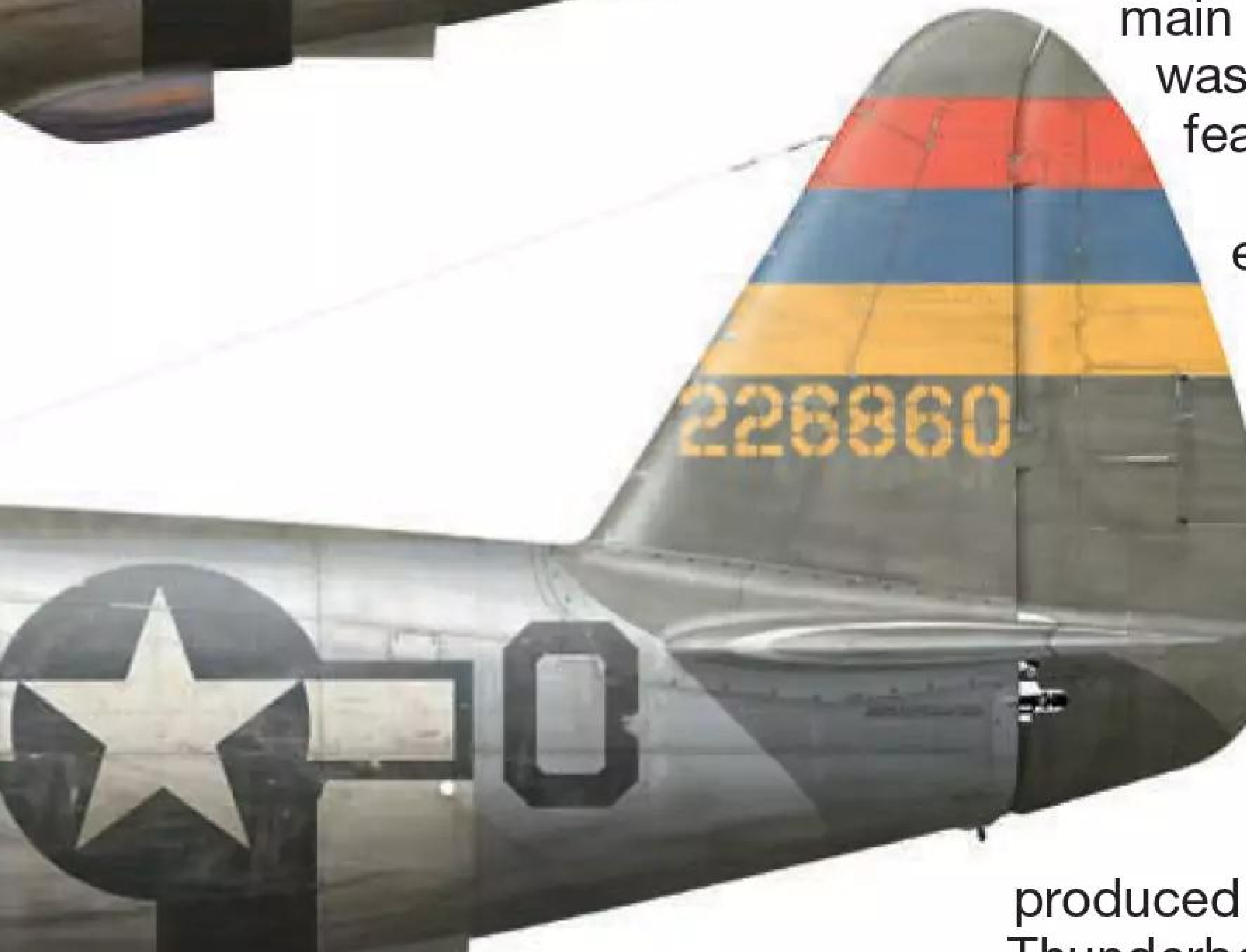
**During his tour of duty, 1st Lieutenant Walker A Diamanti of the 512th FS, 406th FG, flew 'Angie' from Mourmelon-le-Grand in France. This is how the aircraft looked in December 1944. Less than a month later, Diamanti was on his way back to the US and 'Angie' was assigned a new pilot – 2nd Lieutenant Fred V Brandt. At around this time, a huge pinup painting was added to the aircraft's engine cowling. Later in the war, 'Angie' was damaged and fitted with replacement parts plus a new name: 'Patty'.**

## REPUBLIC P-47D-28 THUNDERBOLT ▶

**Another aircraft bearing a striking pinup portrait was 'Dottie Mae' flown by Lieutenant Larry A Kuhl of the 511th FS, 405th FG, stationed at Saint-Dizier, France, during December 1944. He flew a total of 90 combat sorties and destroyed three enemy aircraft on the ground. 'Dottie Mae' crashed shortly after the war while being flown by another pilot, Lieutenant Henry Mohr. Mohr was performing a celebratory flight over a lake in Austria but came in too low and hit the water. Mohr was rescued but 'Dottie Mae' sank – only to be recovered and restored 60 years later.**







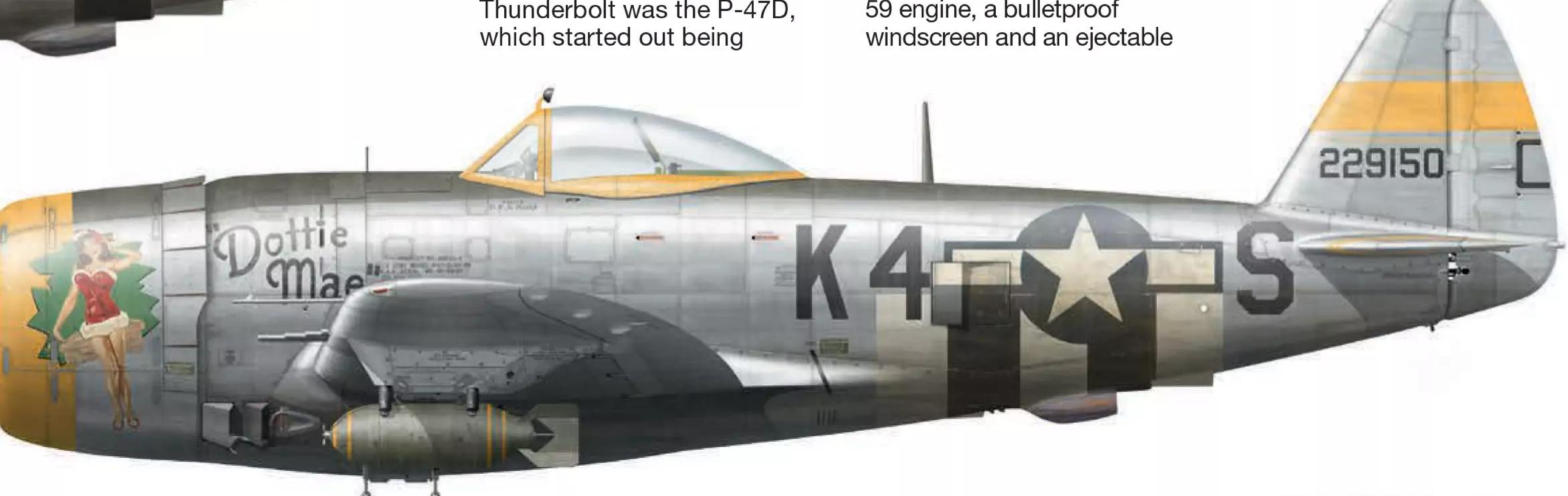
the brakes, undercarriage and electrical systems were improved. Aircraft with these features were designated P-47C-1 and 55 were made. The next 128 aircraft off the line became the P-47C-2, featuring a centreline fuselage hardpoint for carrying either a 500lb bomb or a 200 US gallon drop tank. The main production version was the P-47C-5, which featured a whip aerial.

Most of the P-47's early difficulties had been eliminated by the beginning of 1943 and a batch was sent to England to be operated by the 56th FG as part of the Eighth Air Force.

By far the most produced version of the Thunderbolt was the P-47D, which started out being identical to the P-47C-2 but built by a different factory. However, development of the 'D' progressed rapidly as more and more improvements and refinements were incorporated into the design. These included an increase in the number of engine cooling flaps at the back of the cowl to combat overheating, plus extra armour protection for the pilot.

Underwing pylons for drop tanks or bombs were introduced with the P-47D-15 – offering dramatically increased range or improved ground-attack capability if required. Drop tanks, which were made from laminated paper, gave the P-47 the ability to escort bombers deep into enemy territory. They could not be used to store fuel for extended periods of time but they were lightweight and contained no strategic materials that could be scavenged and reused by the enemy.

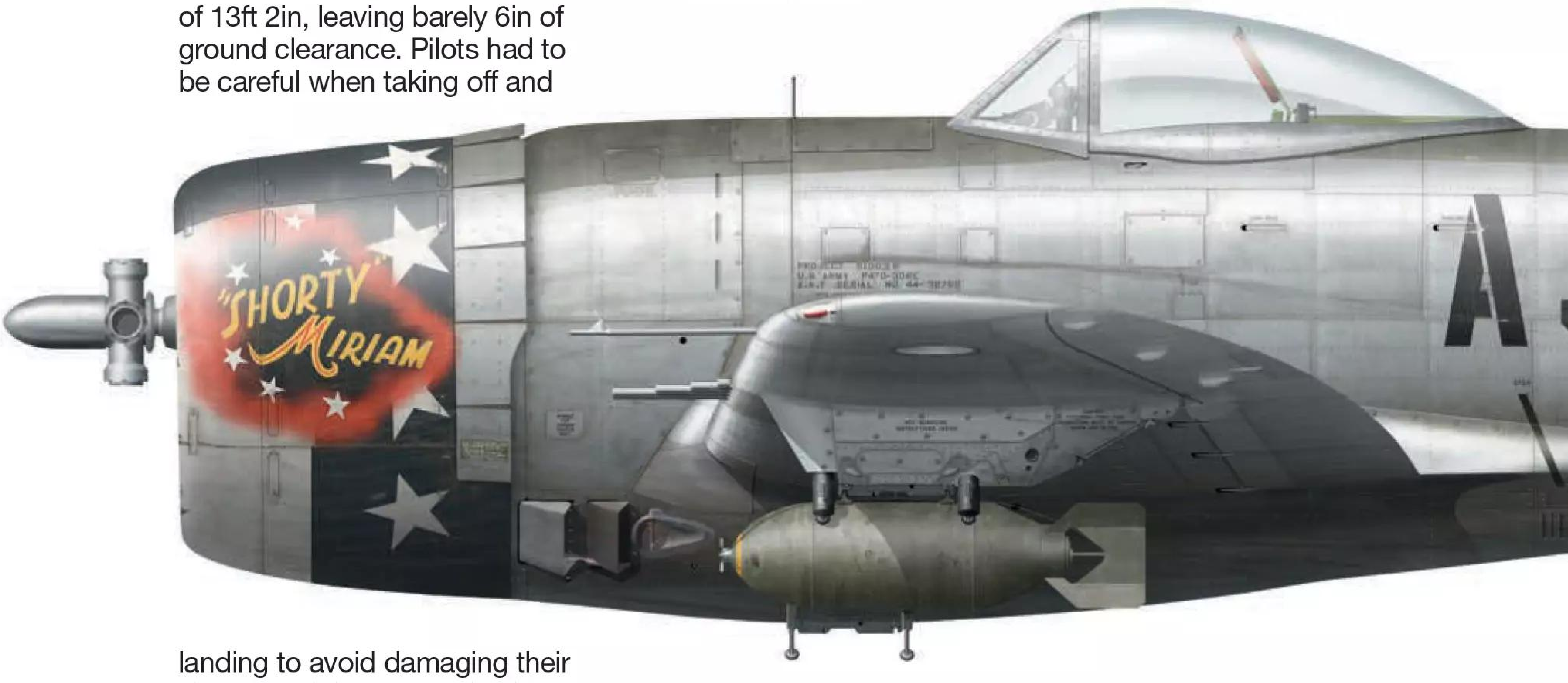
The P-47D-20 saw the introduction of the R-2800-59 engine, a bulletproof windscreen and an ejectable



canopy. And from the D-22, the original enormous propeller was replaced with an even more enormous version – either a 13ft Curtiss model or a Hamilton Standard that had a diameter of 13ft 2in, leaving barely 6in of ground clearance. Pilots had to be careful when taking off and landing to avoid damaging their aircraft and the runway itself.

## REPUBLIC P-47D-30 THUNDERBOLT ▼

**'Shorty Miriam' was flown by Lieutenant Norman E Davis of the 356th FS, 354th FG, stationed at Rosières, Belgium, during December 1944.**

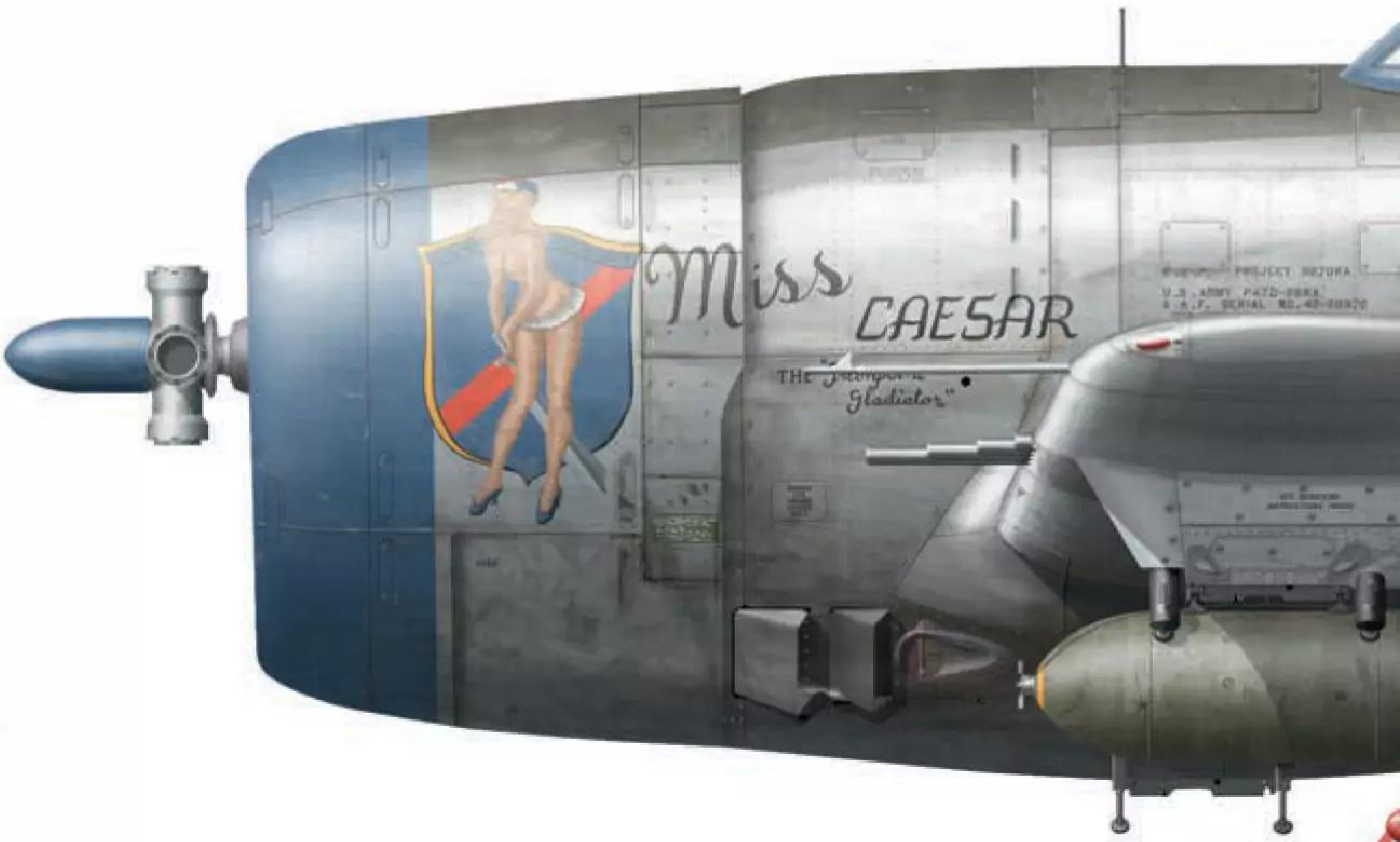


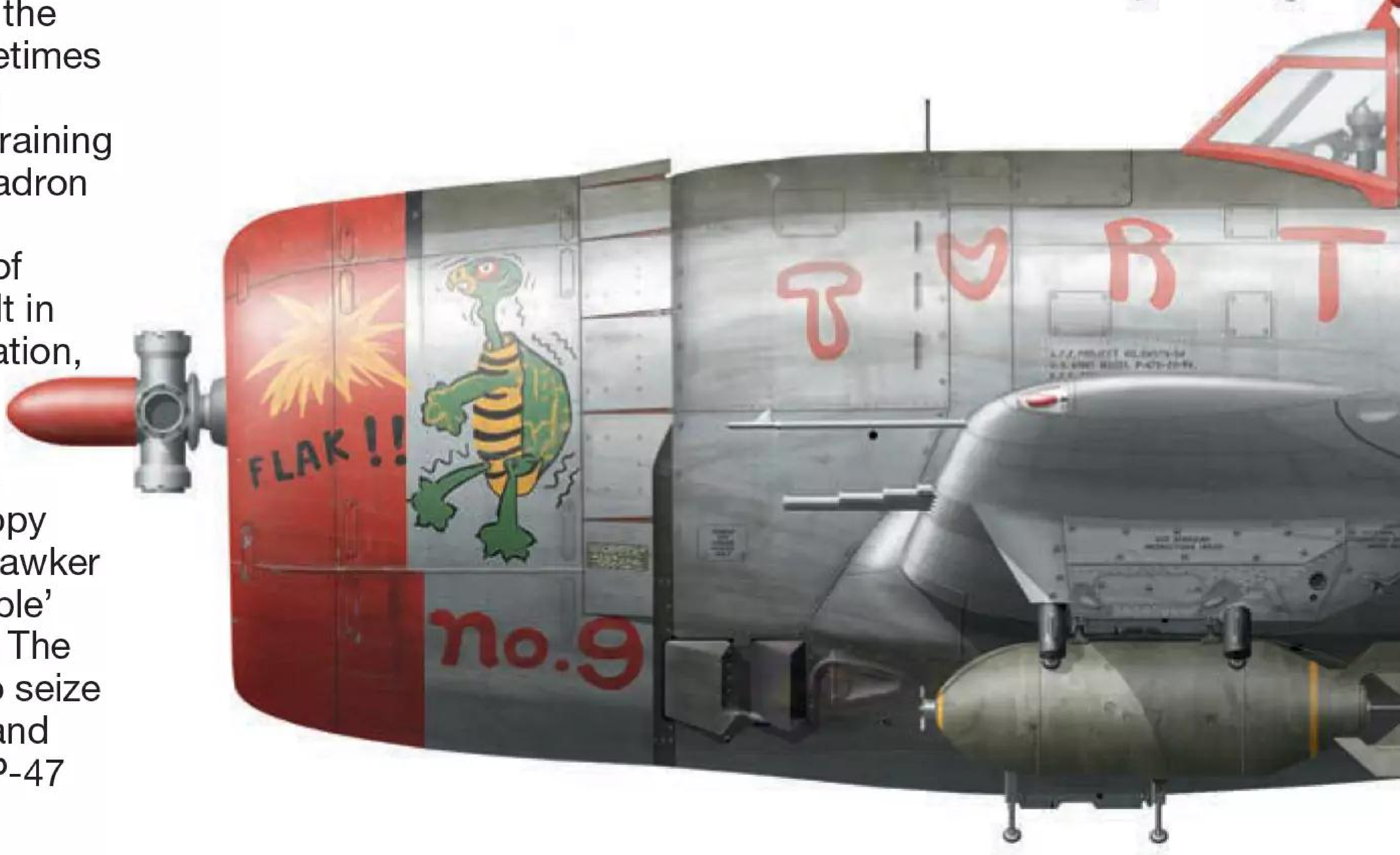
THE BUBBLE CANOPY P-47 WAS INTRODUCED IN MAY 1944

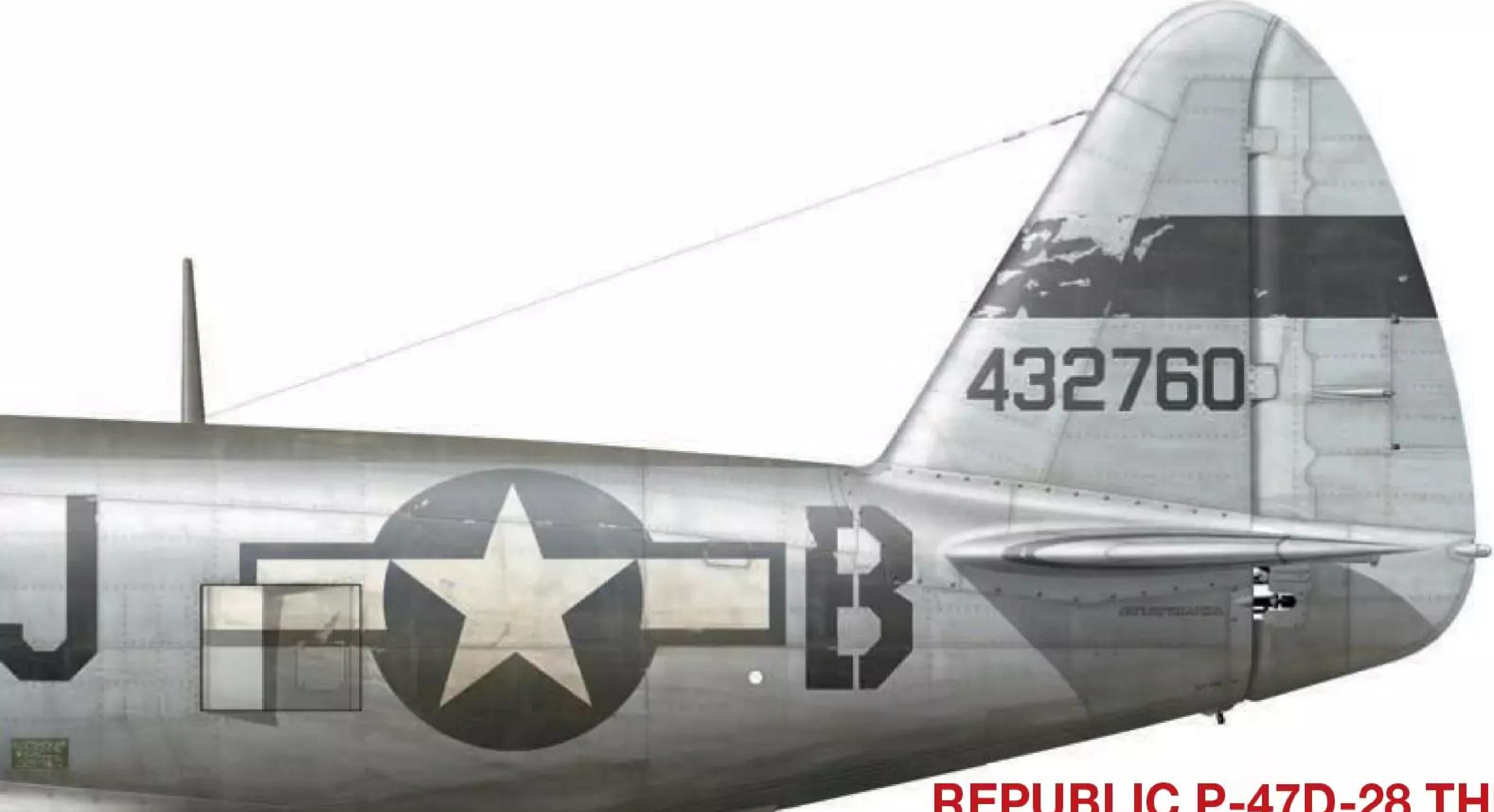
As production of the successful Thunderbolt expanded, Curtiss was brought on board as a sub-contractor. P-47s built at its factory in Buffalo, New York, were designated P-47G. The first of these was identical to the P-47C-1, with the subsequent P-47G-5, G-10 and G-15 being very similar to the D-1, D-5 and D-10 respectively.

A pair of P-47G-15s were built as two-seat trainers, the TP-47G, with a second cockpit created by installing a smaller main fuel tank within the fuselage. The type did not enter full production but the modifications were sometimes carried out in the field to convert older P-47s for training or simply for use as squadron 'hacks'.

During the early part of 1943, all P-47s were built in the 'razorback' configuration, with the consequent poor rearward visibility. A number were fitted with a bulged canopy by the British but then Hawker came up with a full 'bubble' canopy for the Typhoon. The Americans were quick to seize upon this development and introduce it to both the P-47 and the P-51 Mustang.



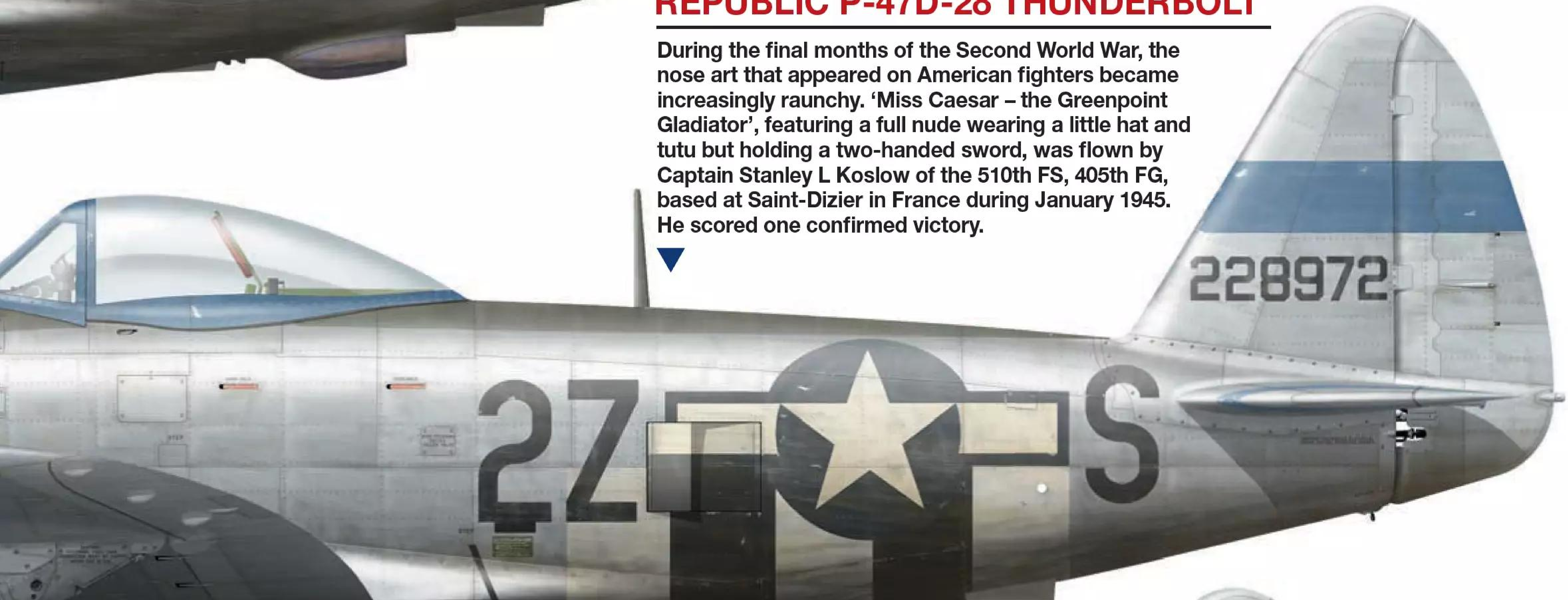


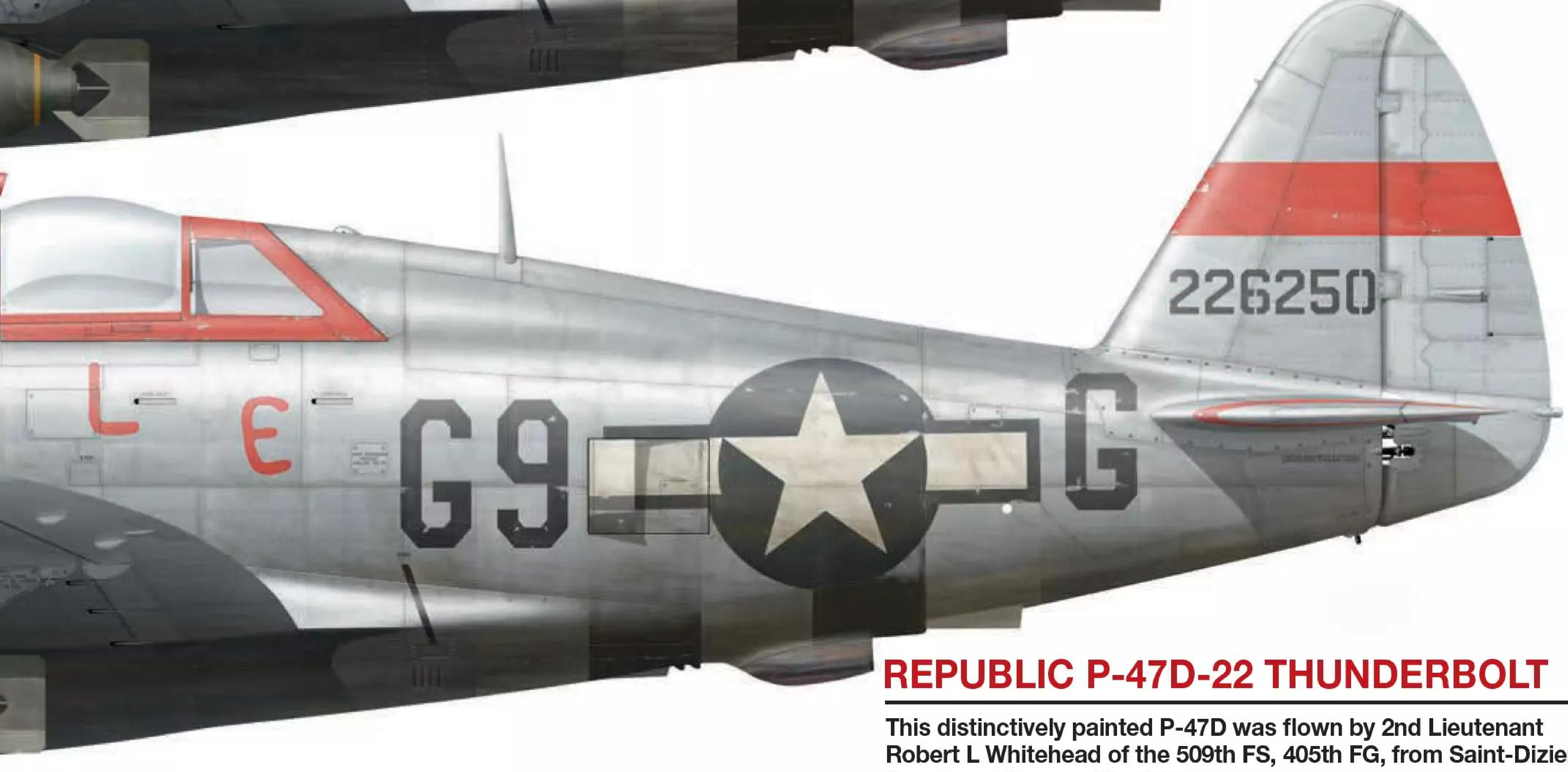


## REPUBLIC P-47D-28 THUNDERBOLT

**During the final months of the Second World War, the nose art that appeared on American fighters became increasingly raunchy. 'Miss Caesar – the Greenpoint Gladiator', featuring a full nude wearing a little hat and tutu but holding a two-handed sword, was flown by Captain Stanley L Koslow of the 510th FS, 405th FG, based at Saint-Dizier in France during January 1945. He scored one confirmed victory.**

▼



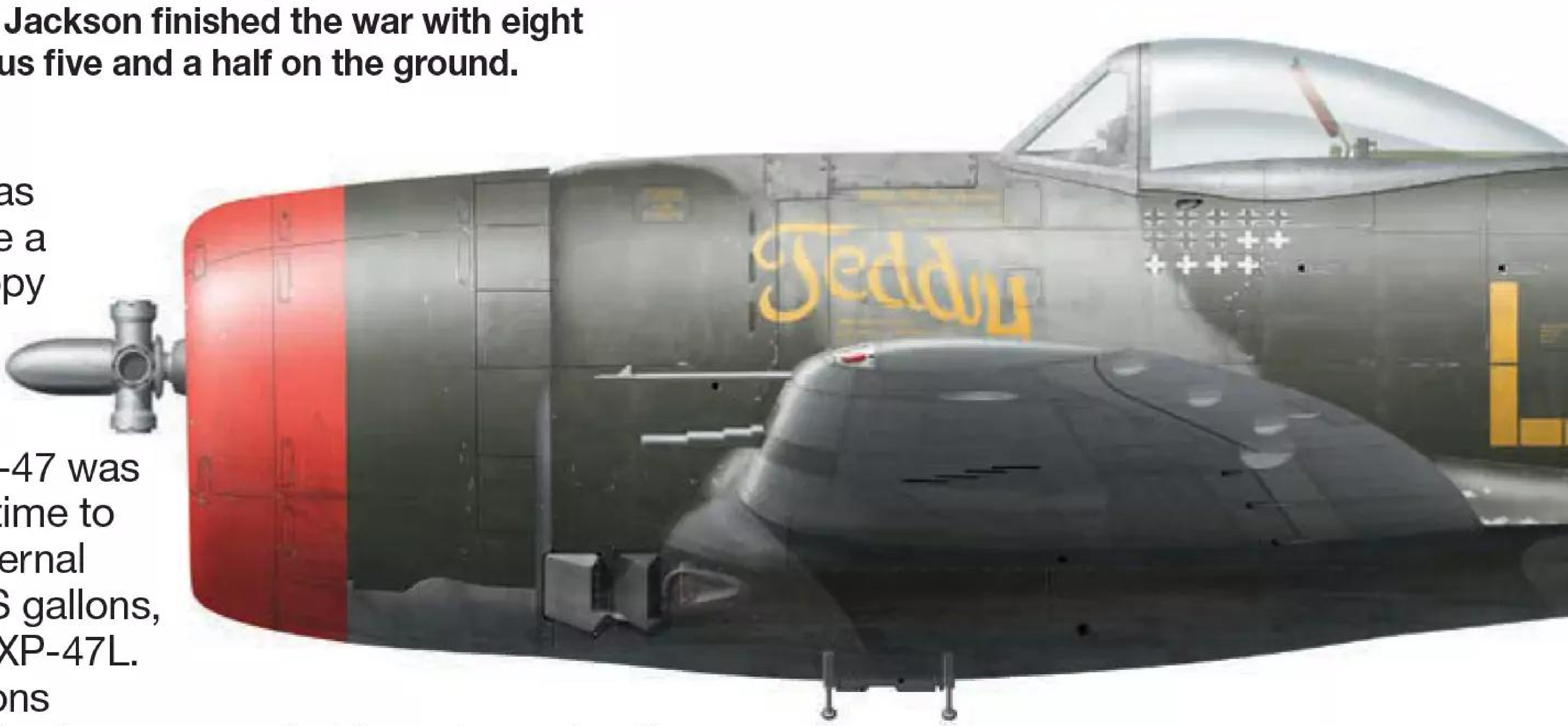


## REPUBLIC P-47D-22 THUNDERBOLT ▲

**This distinctively painted P-47D was flown by 2nd Lieutenant Robert L Whitehead of the 509th FS, 405th FG, from Saint-Dizier in France on January 22, 1945.**

## REPUBLIC P-47M-1 THUNDERBOLT ▼

**'Teddy' was flown by Major Michael J Jackson of the 62nd FS, 56th FG, based at Boxted, England, during February 1945. After flying 86 combat sorties, Jackson finished the war with eight victories in air combat plus five and a half on the ground.**



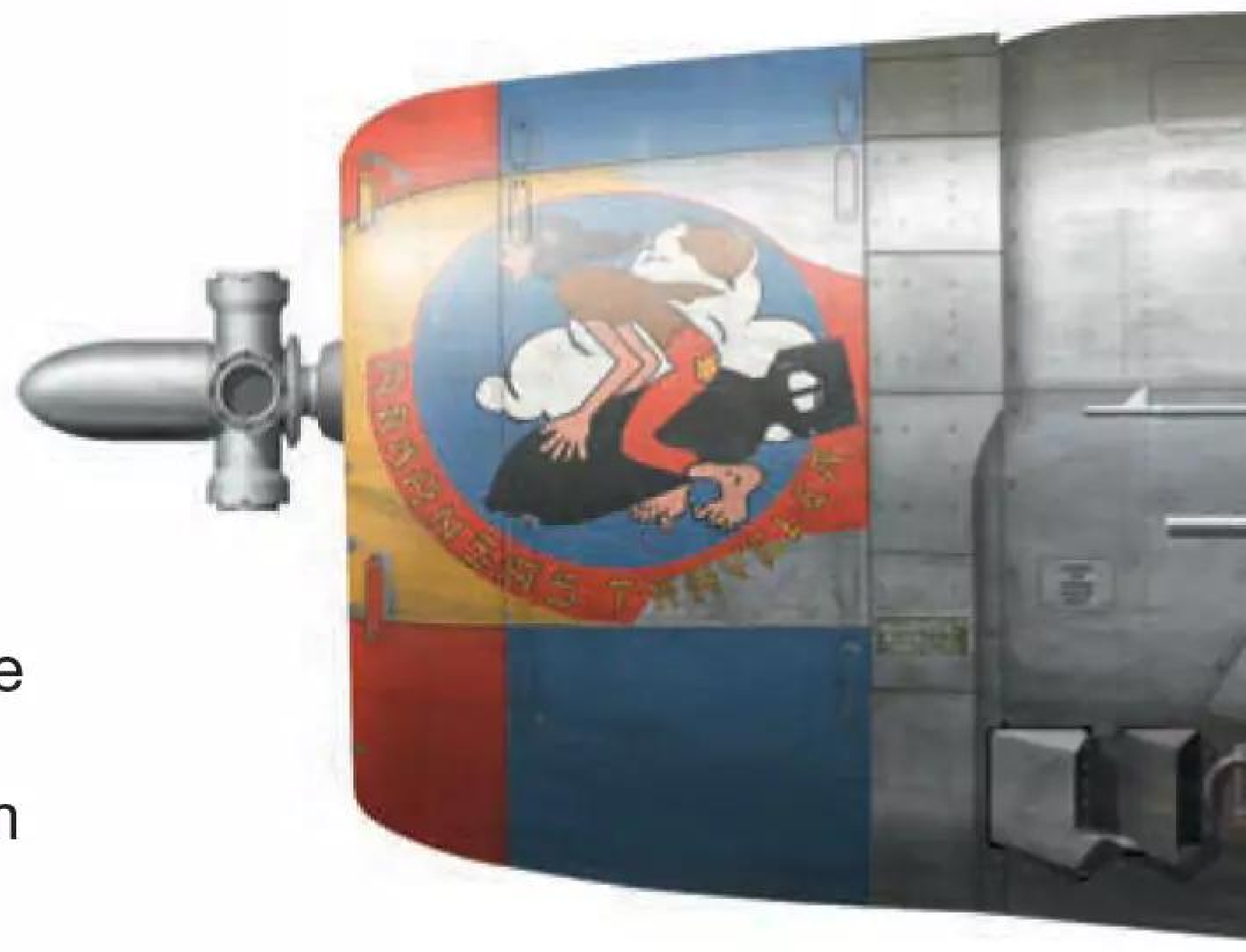
THE EXPERIMENTAL XP-47H HAD A 2300HP ENGINE AND A NEW NOSE

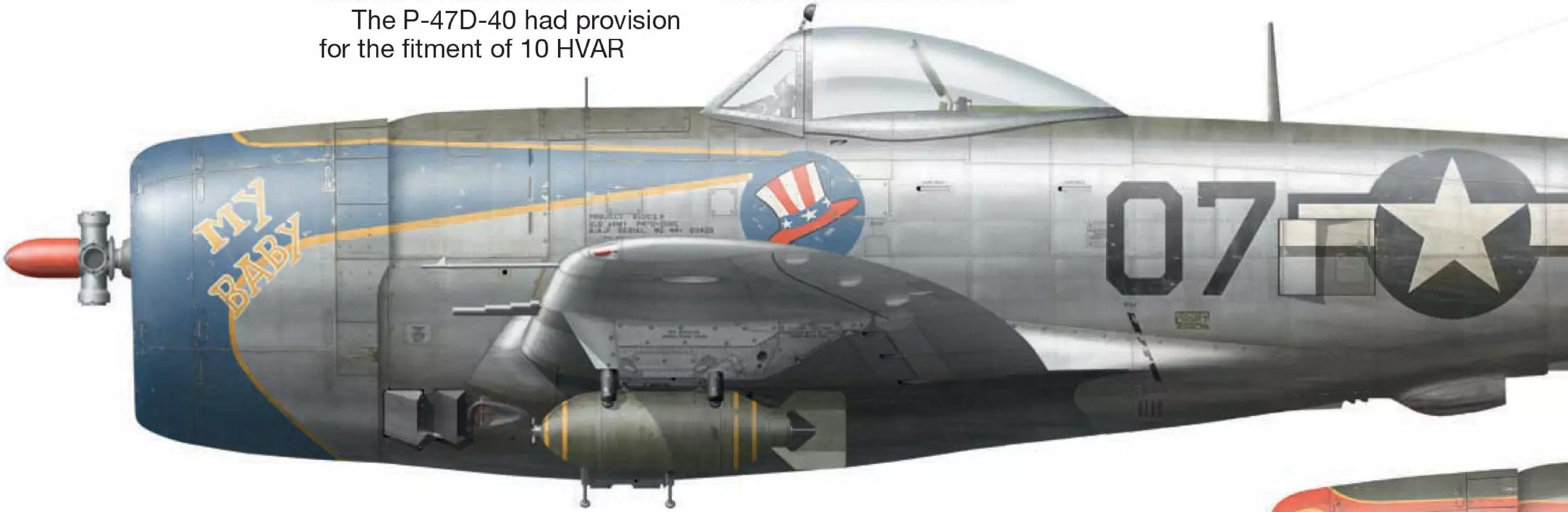
A single P-47D-5 was modified to incorporate a prototype bubble canopy during the summer of 1943, being redesignated the XP-47K. A second older P-47 was also modified but this time to incorporate a larger internal fuel capacity of 370 US gallons, under the designation XP-47L. Both of these innovations were brought into production together for the P-47D-25 and first deliveries of the new type were made to front line units in May 1944.

All future P-47s incorporated the new 'bubbletop' and the D-26, D-27, D-28 and D-30 saw the introduction of further engine improvements and new dive recovery flaps. Experience with the bubbletop showed that reducing the height of the rear fuselage served to produce yaw instability so a new 'fin fillet' was introduced to correct it which ran from the tailfin to a point just behind the radio aerial. Older bubbletops had the fin fillet retrofitted.

The P-47D-40 had provision for the fitment of 10 HVAR rocket launchers plus the new K-14 computing gunsight – a licence-built version of the British Ferranti GGS Mark IID sight. It enabled the pilot to input the target's wingspan and the range, which would then position the gunsight's reticle to allow for the necessary deflection.

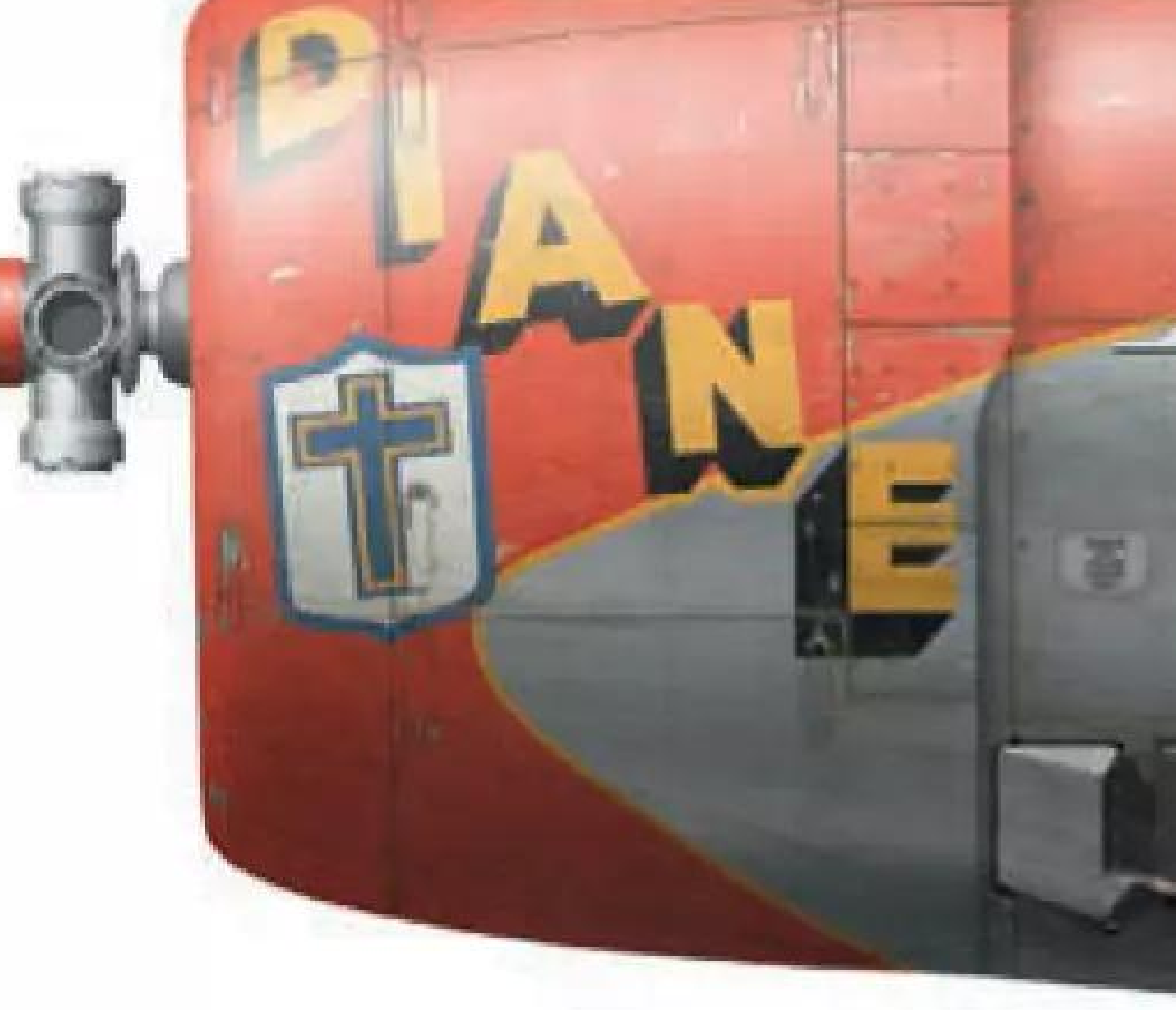
Another experiment with the P-47, this time with a pair of D-15 airframes, was to fit them with 2300hp Chrysler XIV-2220-1 16-cylinder inverted V liquid-cooled engine under the designation XP-47H. This engine, which featured a substantial radiator mounted beneath its fuselage, resulted in a transformation of the





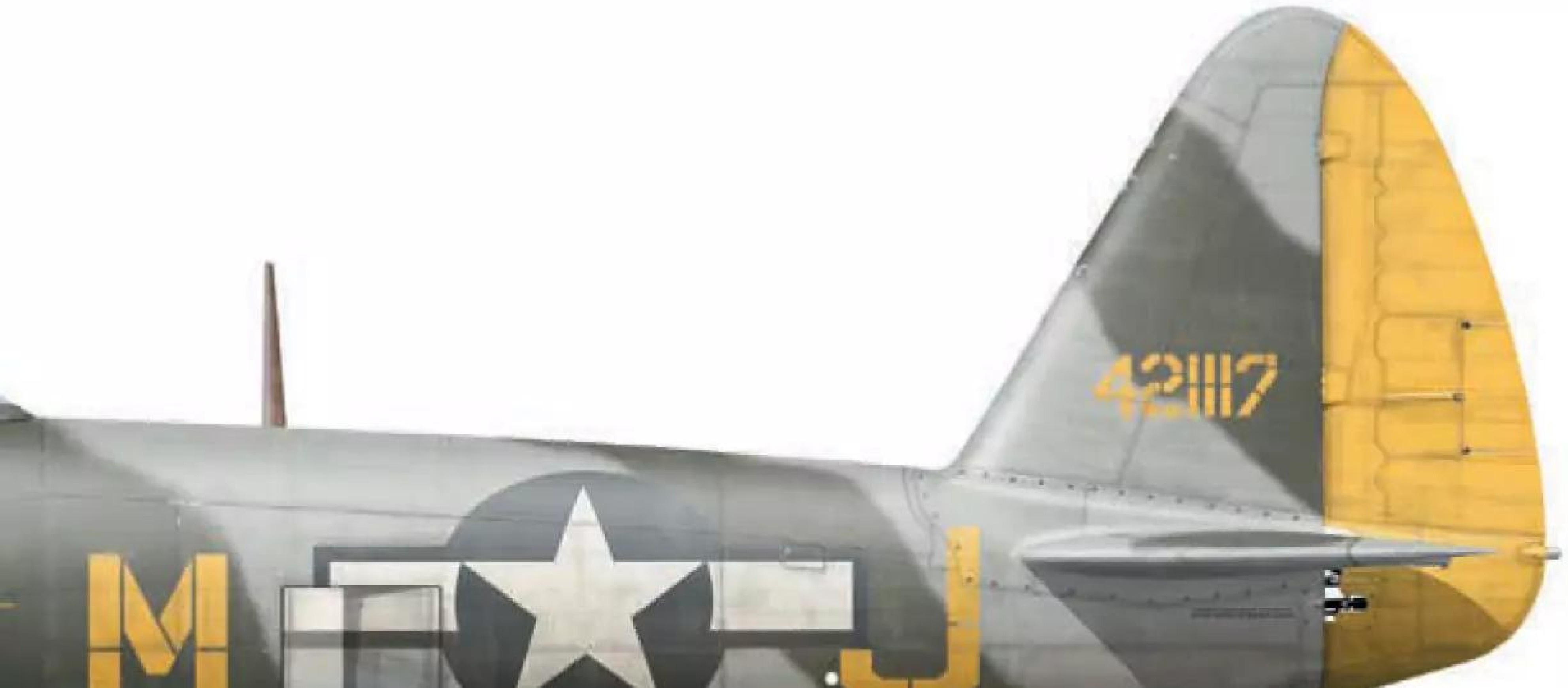
## REPUBLIC P-47D-30 THUNDERBOLT ▲

**'My Baby' was flown by Lieutenant J G Barber of the 514th FS, 406th FG, based at Asch in Belgium, during March 1945.**



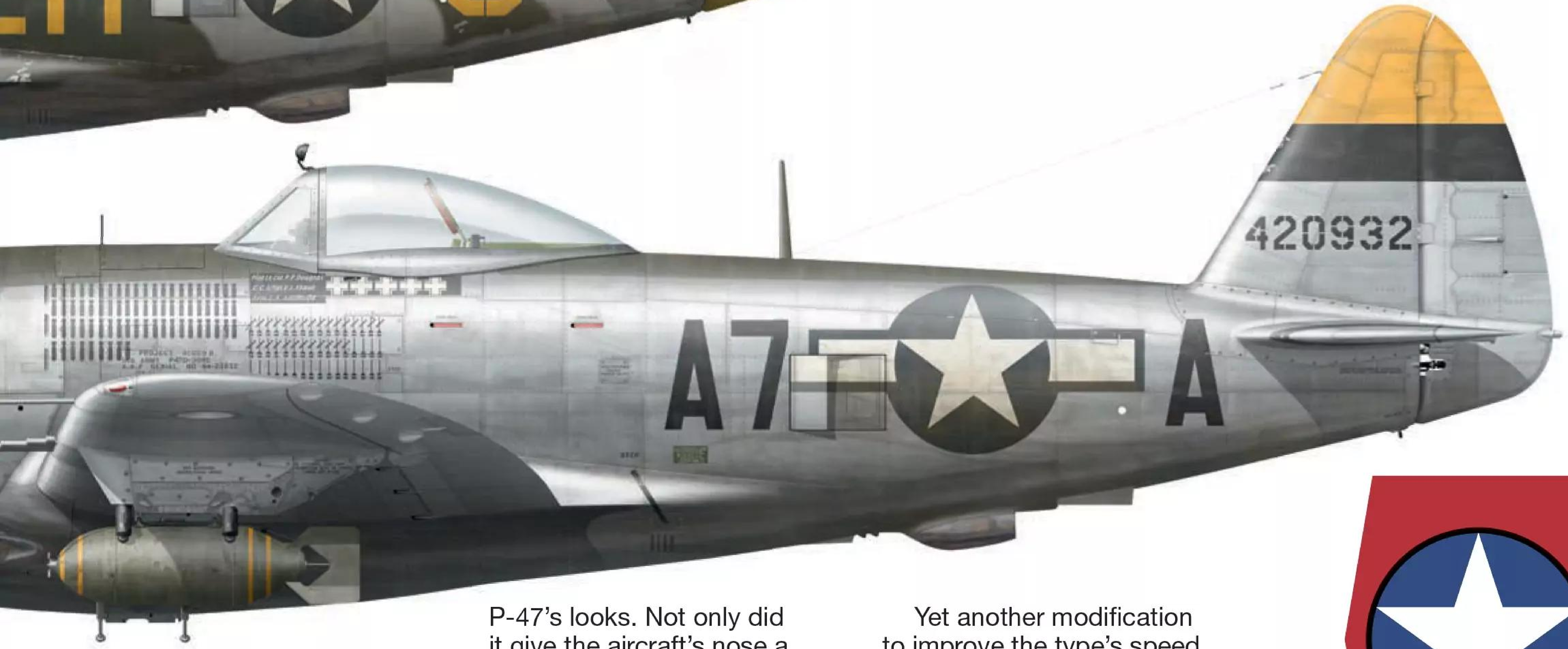
## REPUBLIC P-47D-30 THUNDERBOLT ▶

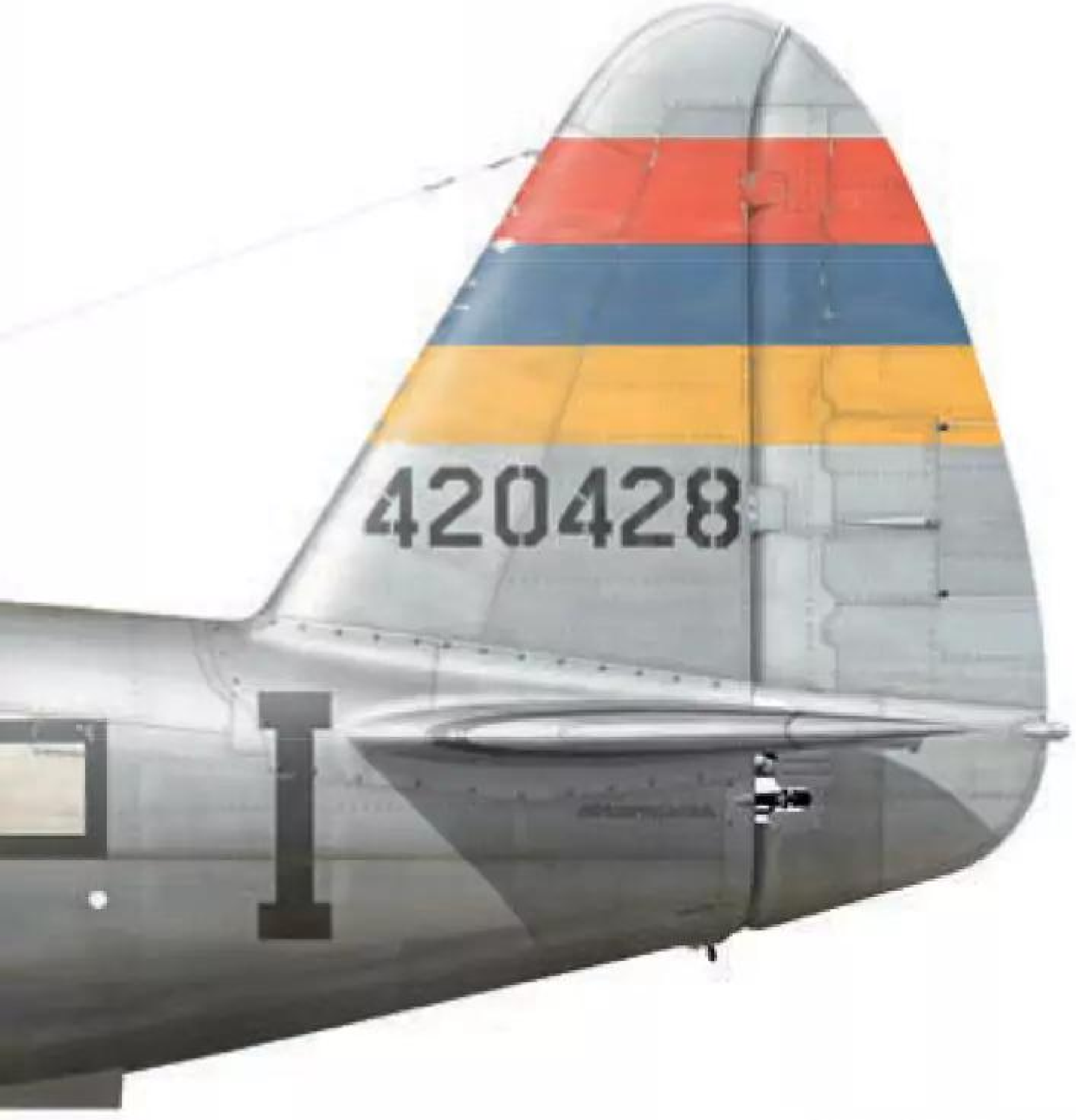
**Lieutenant Richard W Orth of the 513th FS, 406th FG, flew 'Diane' while based at Asch, Belgium, during March 1945.**



## REPUBLIC P-47D-30 THUNDERBOLT ▼

**Former cheerleader and college newspaper reporter Lieutenant Colonel Paul P Douglas flew 'Arkansas Traveler' with the 396th FS, 368th FG, stationed in Metz, France. This is the aircraft as it appeared on March 14, 1945. On that day, with only three other P-47s to accompany him, he attacked a formation of 50 German bombers and fighter-bombers heading towards American lines at the Remagen bridgehead. As a result, some of the Germans dropped their bombs prematurely in order to face him and he shot three of them down. In total, Douglas flew 136 combat sorties and achieved eight victories in air combat.**



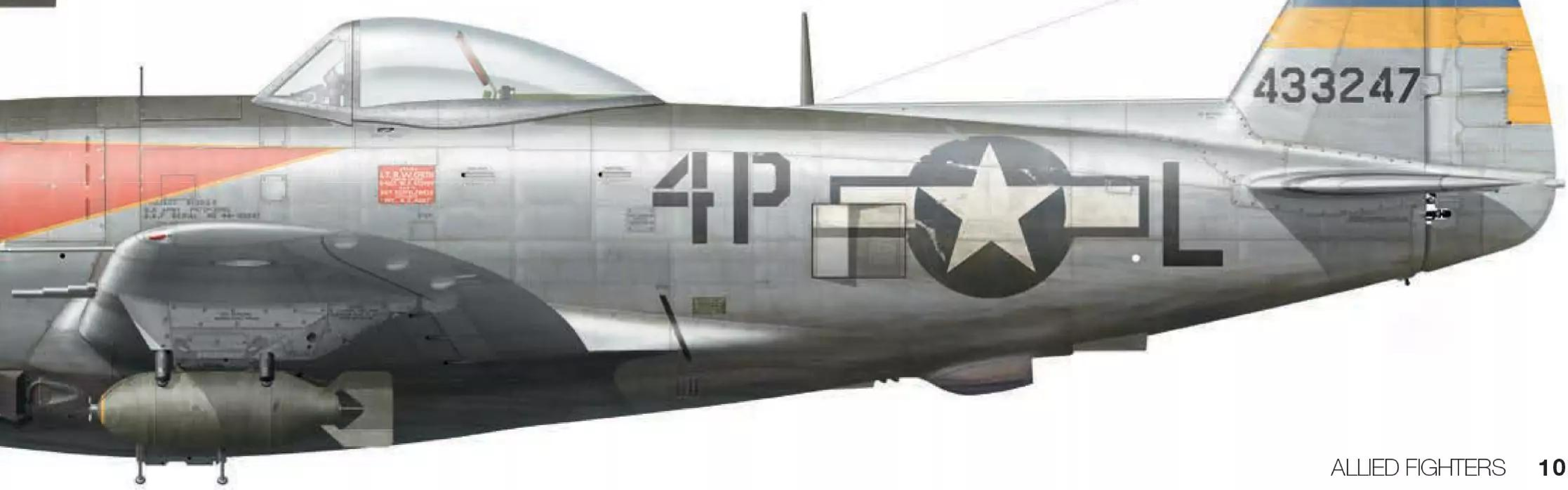


P-47's looks. Not only did it give the aircraft's nose a completely different shape, but it also increased its length from 36ft 1in to 39ft 2in. Initially, it was believed that this radical alteration of the original design would result in a top speed of 490mph.

Work on the conversion was begun in August 1943 but was not completed until 1945. The first test flights took place after the war had ended, in July 1945, and proved to be a disappointment with a top speed of only 414mph being achieved – worse than that of a standard P-47.

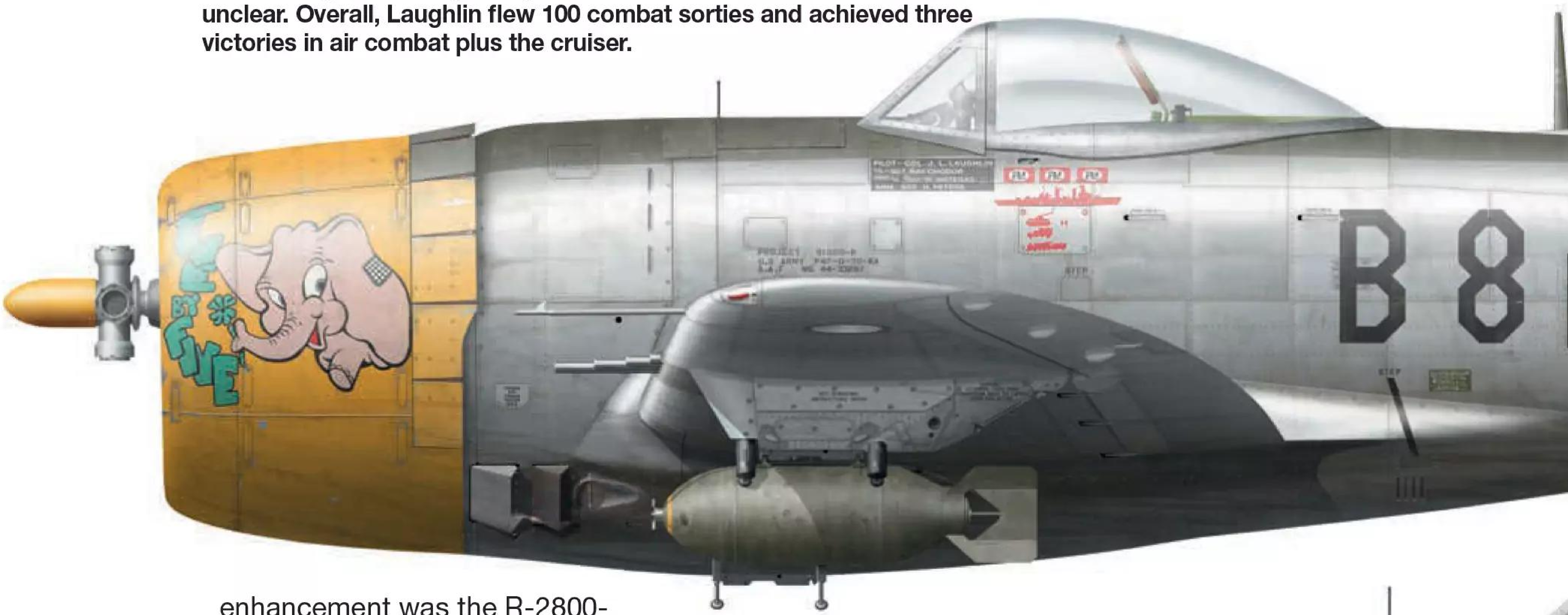
Yet another modification to improve the type's speed was the XP-47J. This involved fitting a Pratt & Whitney R-2800-57 capable of producing up to 2800hp. It was first flown in late November 1943 and when the new powerplant was paired with a General Electric CH-5 turbo-supercharger it achieved a top speed of 505mph in level flight – a new record for a piston-engined aircraft.

The P-47M was also an attempt to gain more speed – particularly for the purpose of intercepting V-1 flying bombs. Its main performance



## REPUBLIC P-47D-30 THUNDERBOLT

**One of the most unusual victory claims of any P-47 pilot was made by Colonel Joseph L Laughlin of the 379th FS, 362nd FG, who flew 'Five by Five' from Etain, France, in March 1945. During an attack on Brest harbour in 1944 he evidently managed to bomb a light cruiser and was credited with sinking it – although the precise circumstances of this event are unclear. Overall, Laughlin flew 100 combat sorties and achieved three victories in air combat plus the cruiser.**

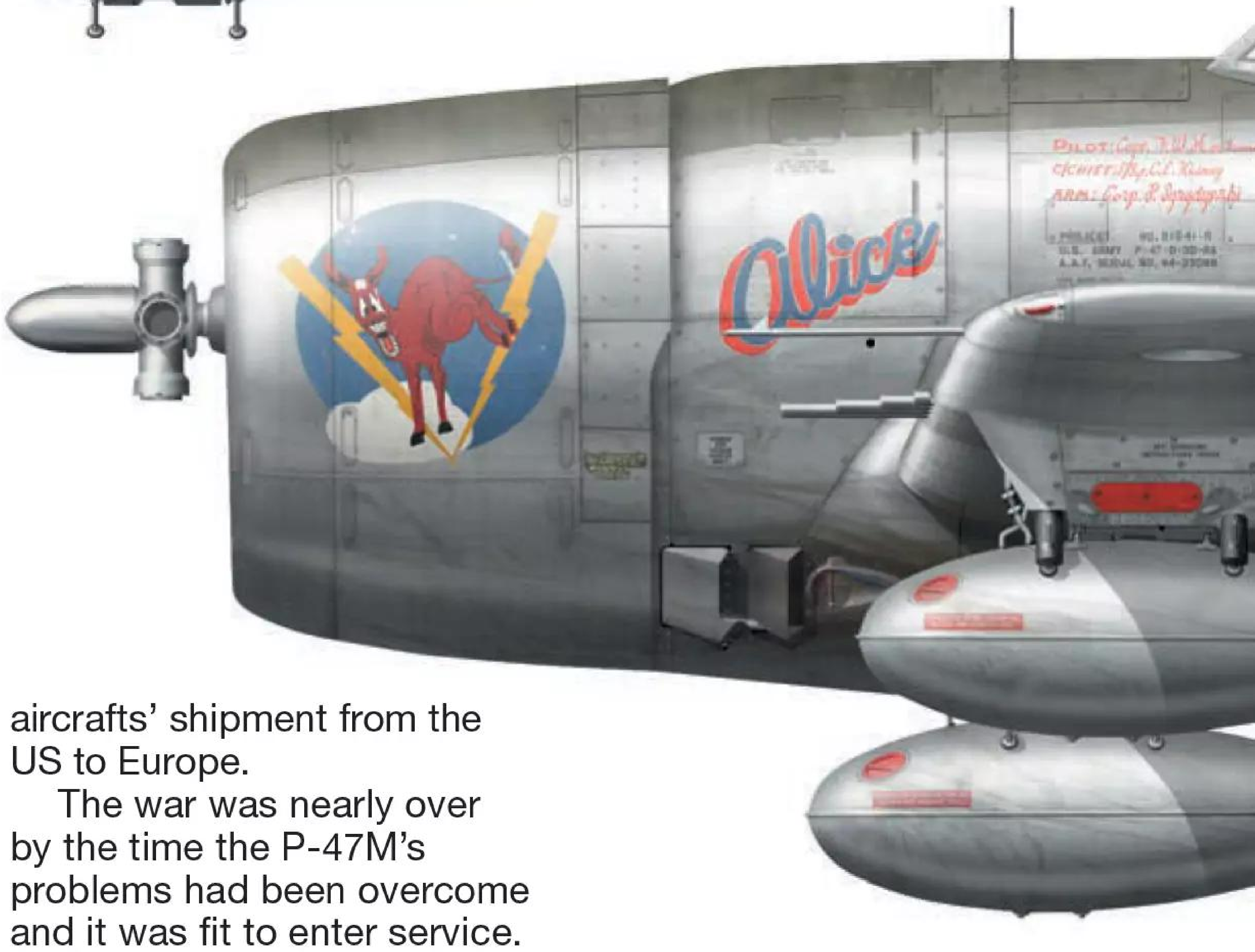


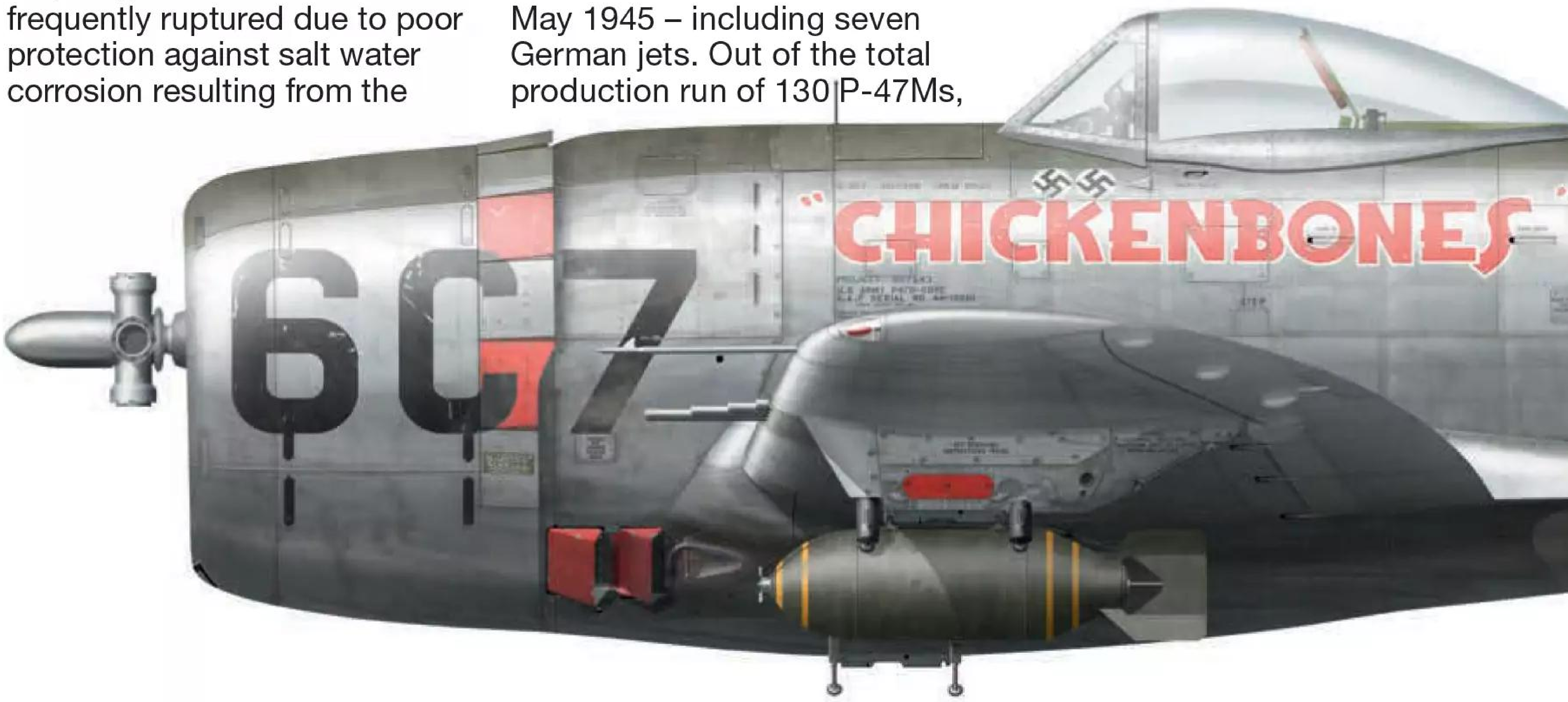
enhancement was the R-2800-57 and CH-5 combination but two of its eight .50 cal machine guns were also removed to reduce weight. Air brakes were fitted to the lower surfaces of the P-47M's wings to allow time for aiming and firing after a high speed dive on a target.

Four old P-47D-27 airframes received the modifications in September 1944 to become YP-47Ms. These were able to achieve a top speed of 473mph and the type was put into limited production – just 133 examples being produced.

Unfortunately, the R-2800-57's high state of tune caused serious problems with the P-47M. Engine failure became common due to cracked ignition harnesses at high altitude, electrical problems, and carburettor valve diaphragm failures. Oil tanks frequently ruptured due to poor protection against salt water corrosion resulting from the aircrafts' shipment from the US to Europe.

The war was nearly over by the time the P-47M's problems had been overcome and it was fit to enter service. Even so, P-47Ms were still responsible for the destruction of 15 enemy aircraft in aerial combat between March and May 1945 – including seven German jets. Out of the total production run of 130 P-47Ms,

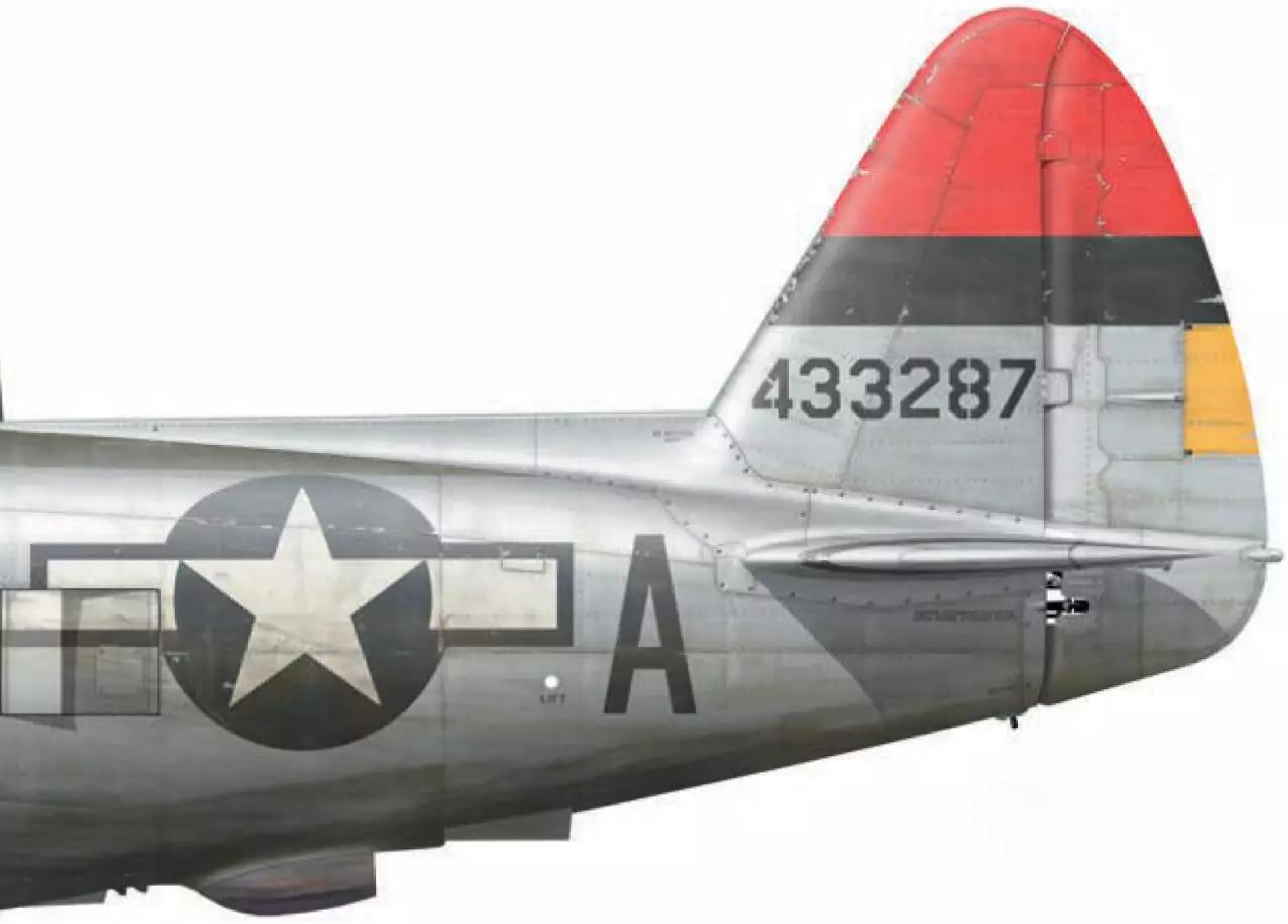


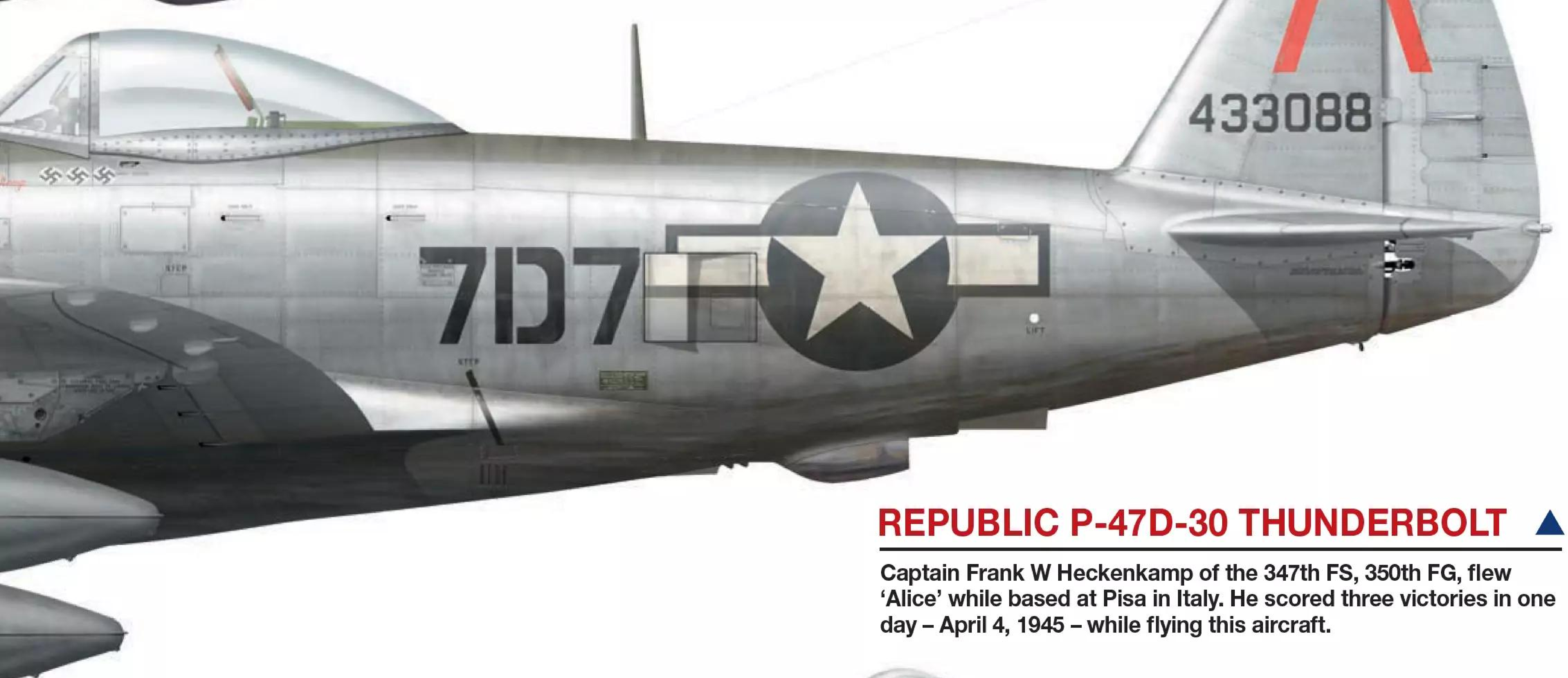


**FIFTEEN ENEMY AIRCRAFT, INCLUDING SEVEN JETS, WERE SHOT DOWN BY P-47MS**

12 were lost in crashes with 11 pilots being killed.

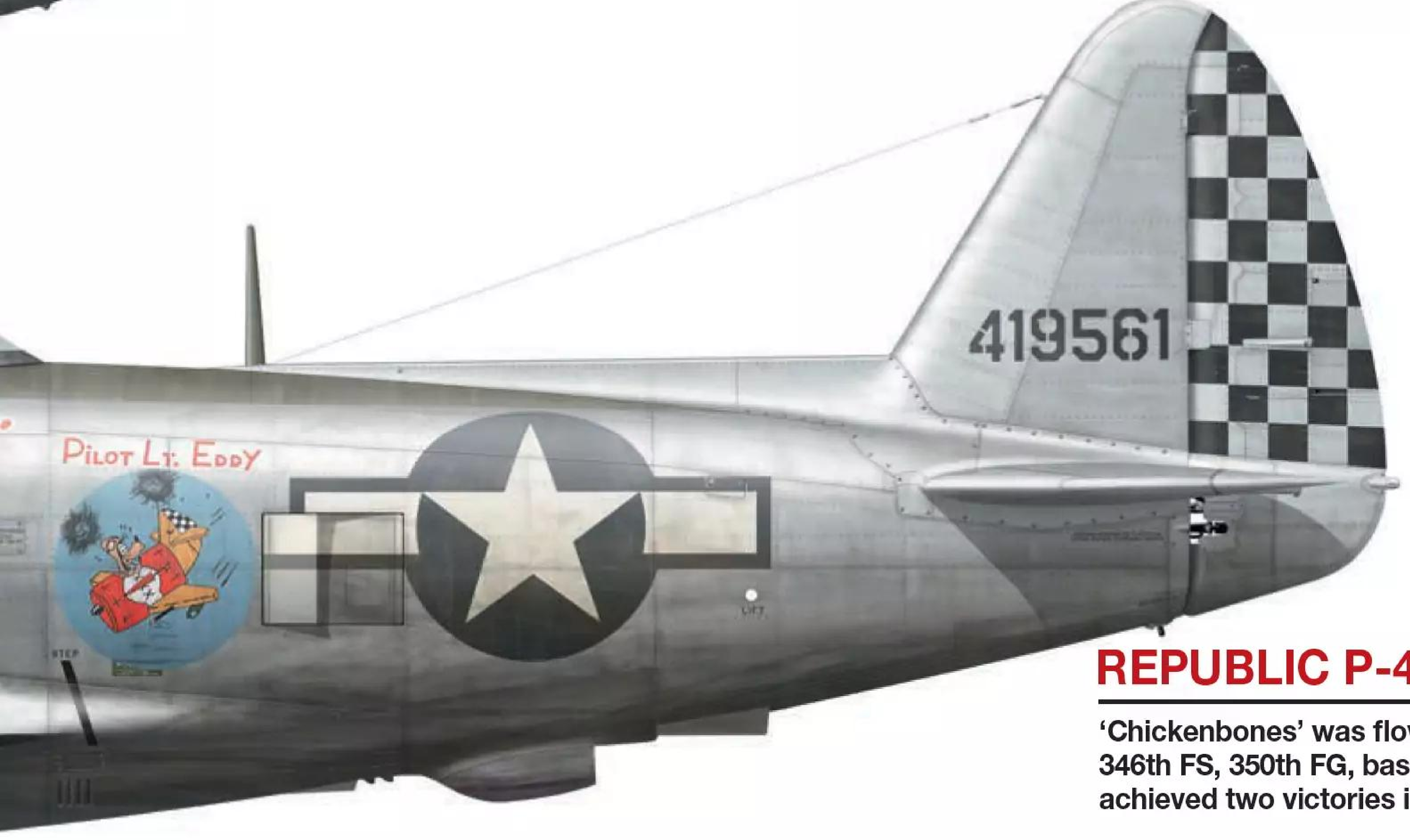
The final Thunderbolt variant, the P-47N, was designed specifically for escorting B-29 bombers on raids over the Japanese home islands. Therefore, its range was increased with new fuel tanks being built into its wings. It also had squared-off wingtips to improve its roll rate. The first experimental version, the XP-47N, was first flown in July 1944 and it was determined that the type's range could be boosted to around 2000 miles. Initially powered by the R-2800-57, later production was switched to the R-2800-





## REPUBLIC P-47D-30 THUNDERBOLT ▲

**Captain Frank W Heckenkamp of the 347th FS, 350th FG, flew 'Alice' while based at Pisa in Italy. He scored three victories in one day – April 4, 1945 – while flying this aircraft.**

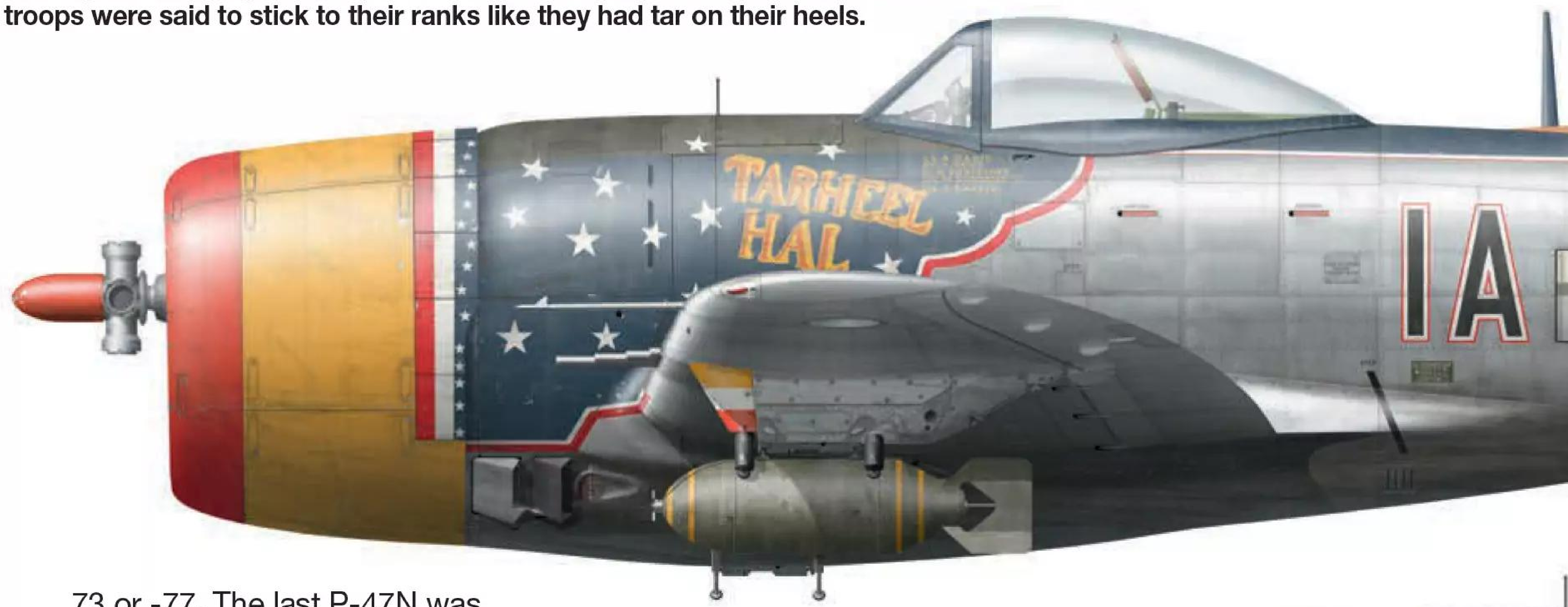


## REPUBLIC P-47D-28 THUNDERBOLT ◀

**'Chickenbones' was flown by 1st Lieutenant Clark C Eddy of the 346th FS, 350th FG, based at Pisa in Italy, during April 1945. Eddy achieved two victories in air combat.**

## REPUBLIC P-47D-30 THUNDERBOLT ▼

**The original 'Tarheel Hal' was written off due to damage sustained during a ground-attack mission, so this is its replacement, Lieutenant 'Ike' Davis of the 366th FS, 358th FG, stationed at Toul in France, during March 1945. Davis was from North Carolina, the 'Tarheel State' and Hal was his brother. The original meaning of 'tar heel' came from the American Civil War when the North Carolina troops were said to stick to their ranks like they had tar on their heels.**



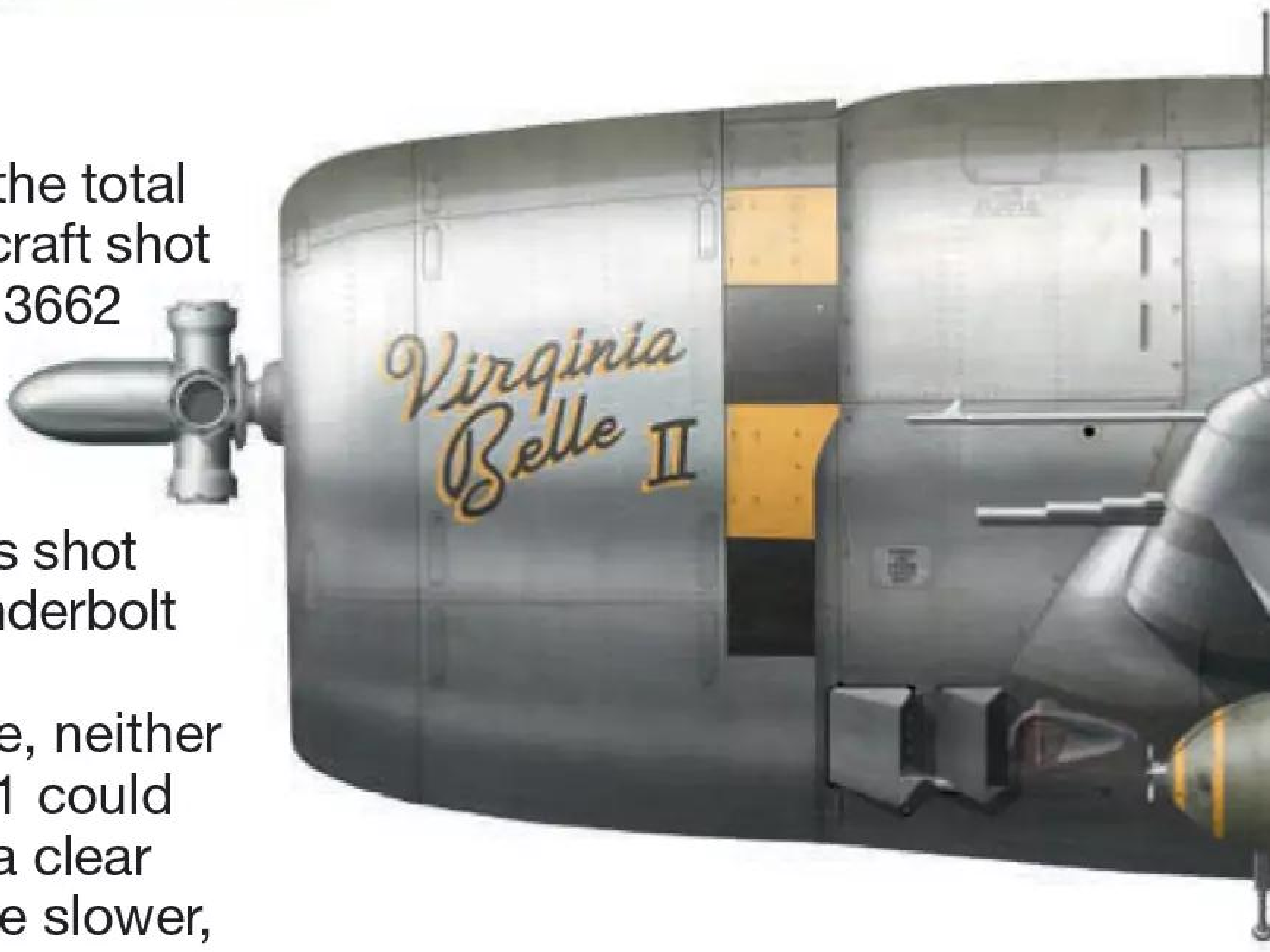
PILOTS GENERALLY PREFERRED THE P-51 TO THE P-47 BECAUSE IT WAS EASIER TO FLY

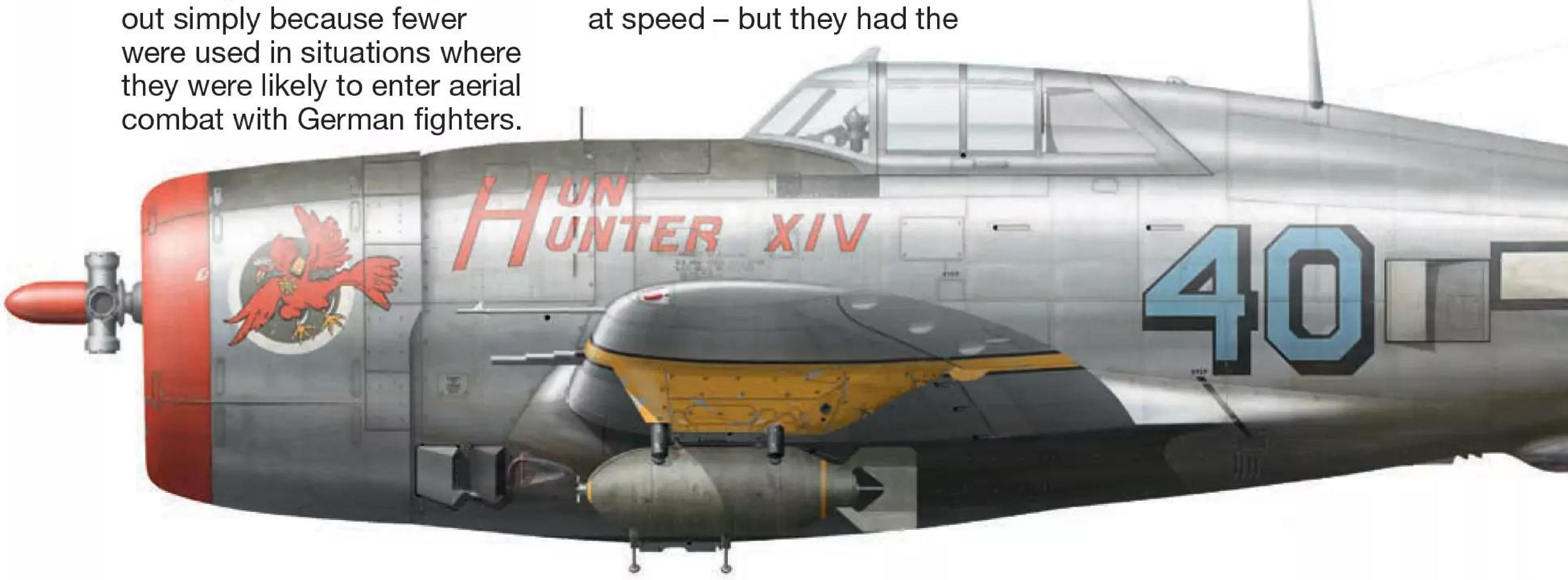
73 or -77. The last P-47N was completed in October 1945.

The Thunderbolt's chief rival for the title of top wartime American fighter was the North American Mustang. On paper, the Thunderbolt seemed to have the edge over the Mustang, but pilots told a different story. The Mustang was simply more agile – it handled better and was easier to fly well. Against German fighters, the Thunderbolt seems to have been just as effective at all altitudes. In the end, the Thunderbolt lost out simply because fewer were used in situations where they were likely to enter aerial combat with German fighters.

One source gives the total number of enemy aircraft shot down by the P-47 as 3662 compared to the P-51's 5944. General der Jagdflieger Adolf Galland's Me 262 was shot down by a P-47 Thunderbolt though, not a P-51.

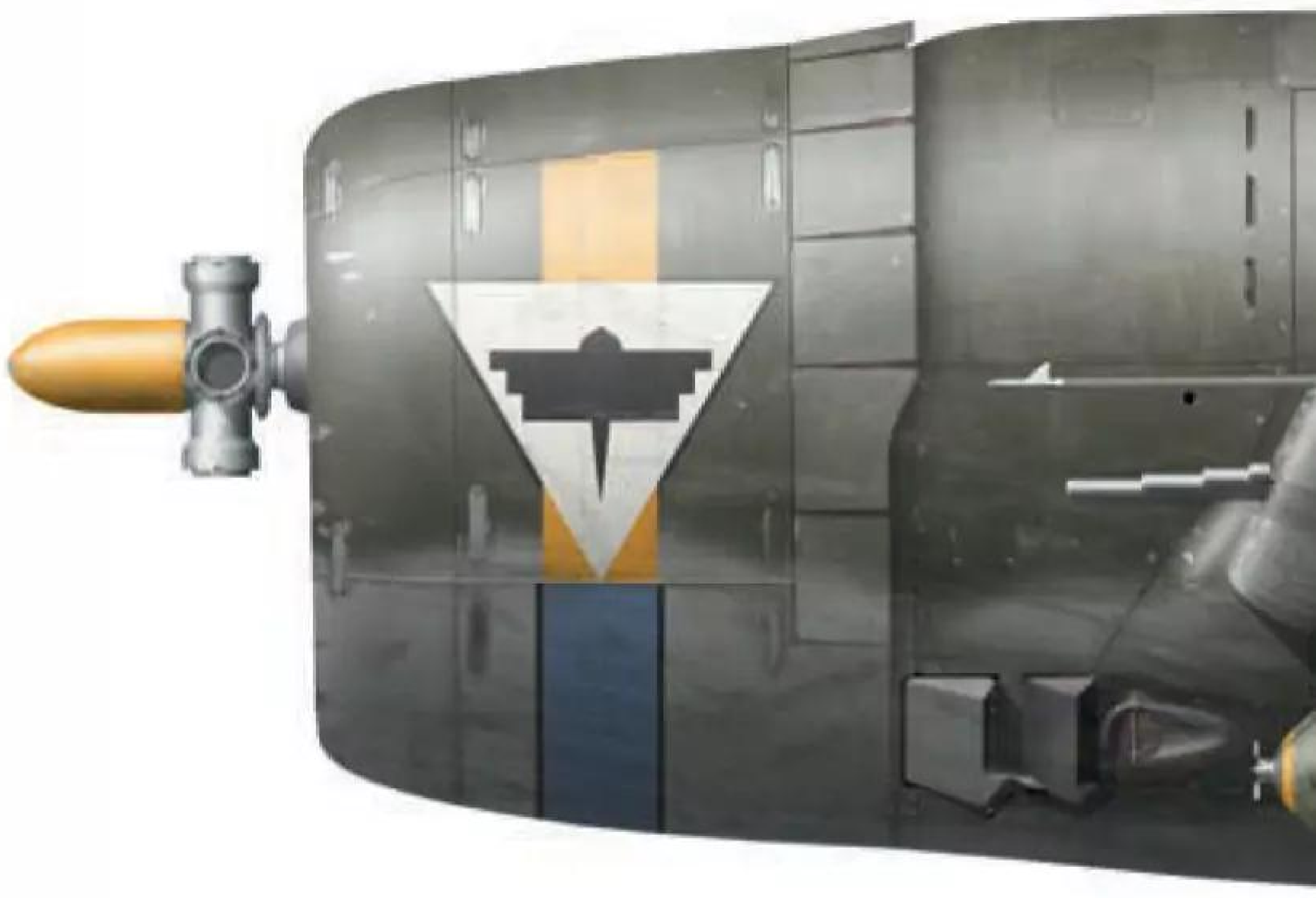
Against the Spitfire, neither the P-47 nor the P-51 could be said to have had a clear advantage. Both were slower, less manoeuvrable at all altitudes and less able to climb at speed – but they had the





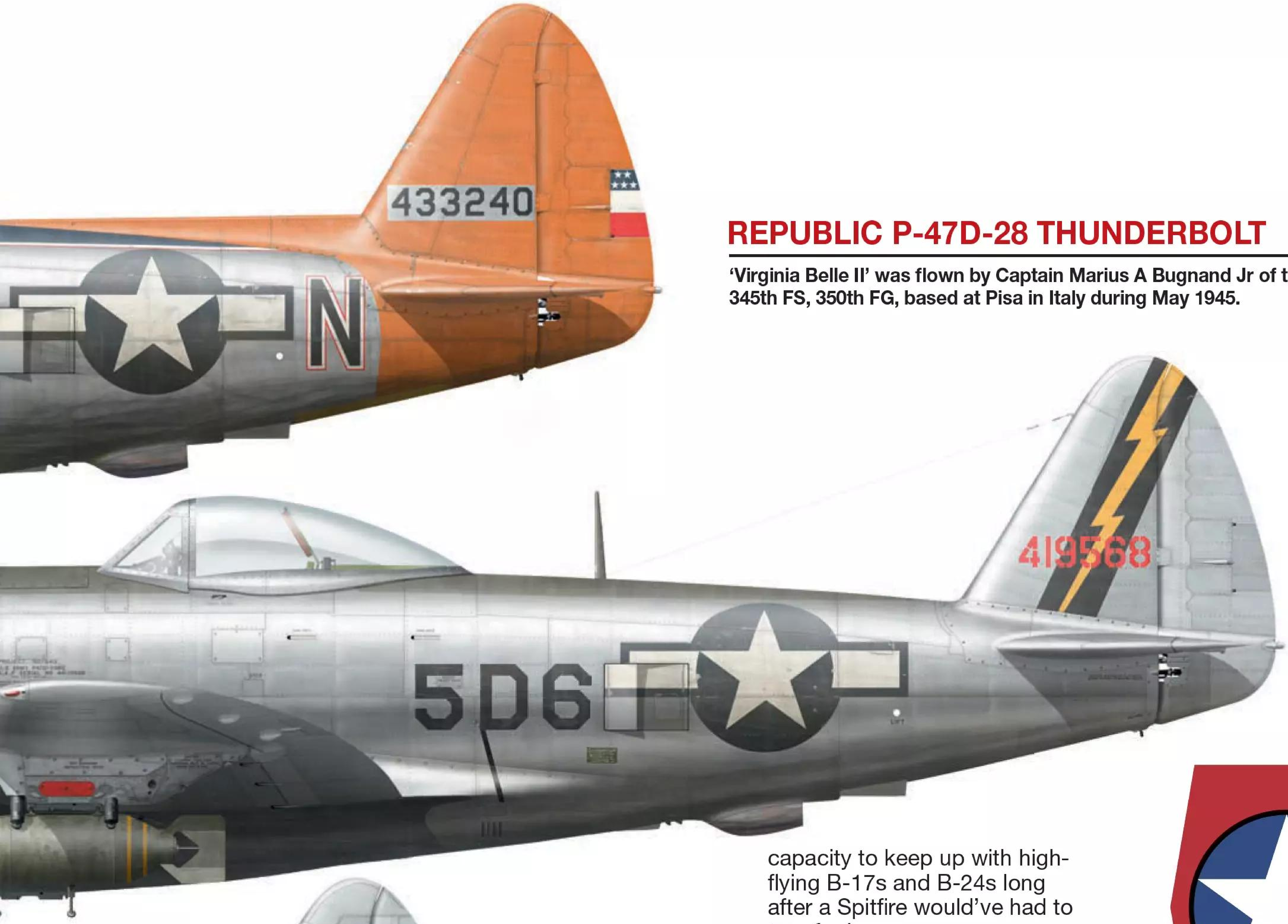
## REPUBLIC P-47D-23 THUNDERBOLT ▲

**Lieutenant Colonel Gilbert O 'Gil' Wymond commander of the 65th FS, 57th FG, was the driving force behind efforts to redevelop the P-47 into an effective ground-attack aircraft. He called for modification which increased the accuracy of its weapons delivery during bombing and strafing missions and also to increase its overall bomb load. He flew 'Hun Hunter XIV' while based at Alto, Corsica, during August 1944. Wymond had three confirmed aerial victories plus two probables.**



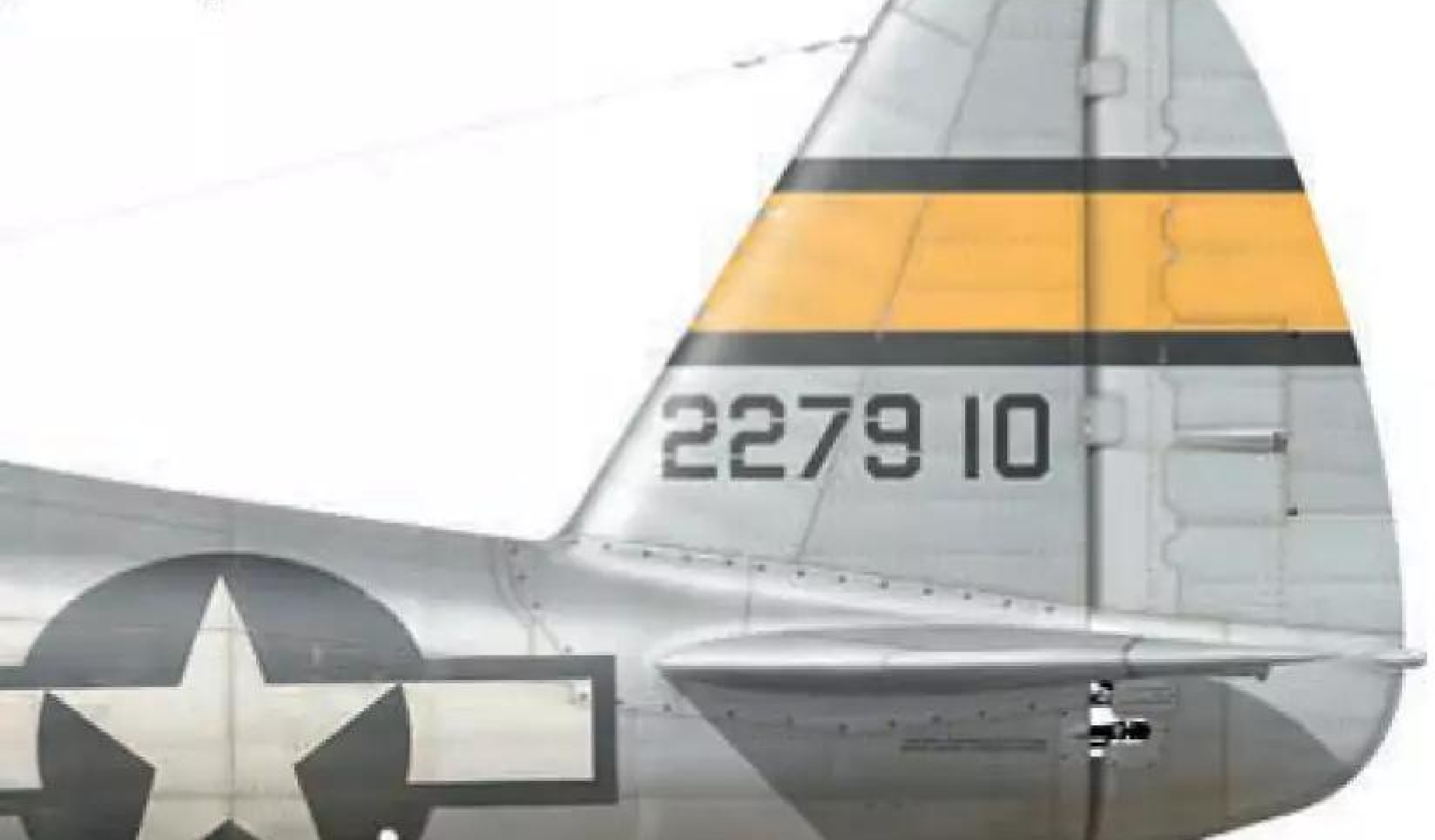
## REPUBLIC P-47D-28 THUNDERBOLT

**'Virginia Belle II' was flown by Captain Marius A Bugnand Jr of the 345th FS, 350th FG, based at Pisa in Italy during May 1945.**



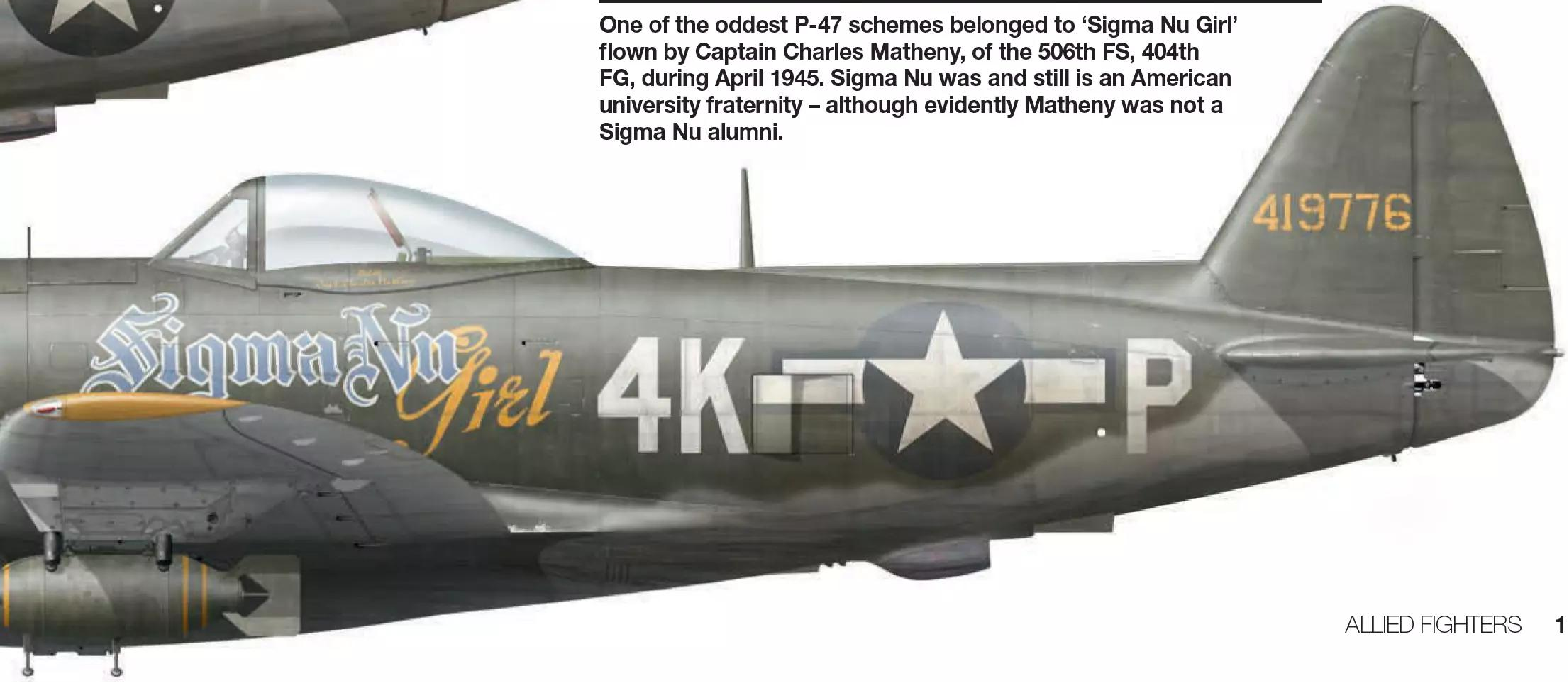
capacity to keep up with high-flying B-17s and B-24s long after a Spitfire would've had to turn for home.

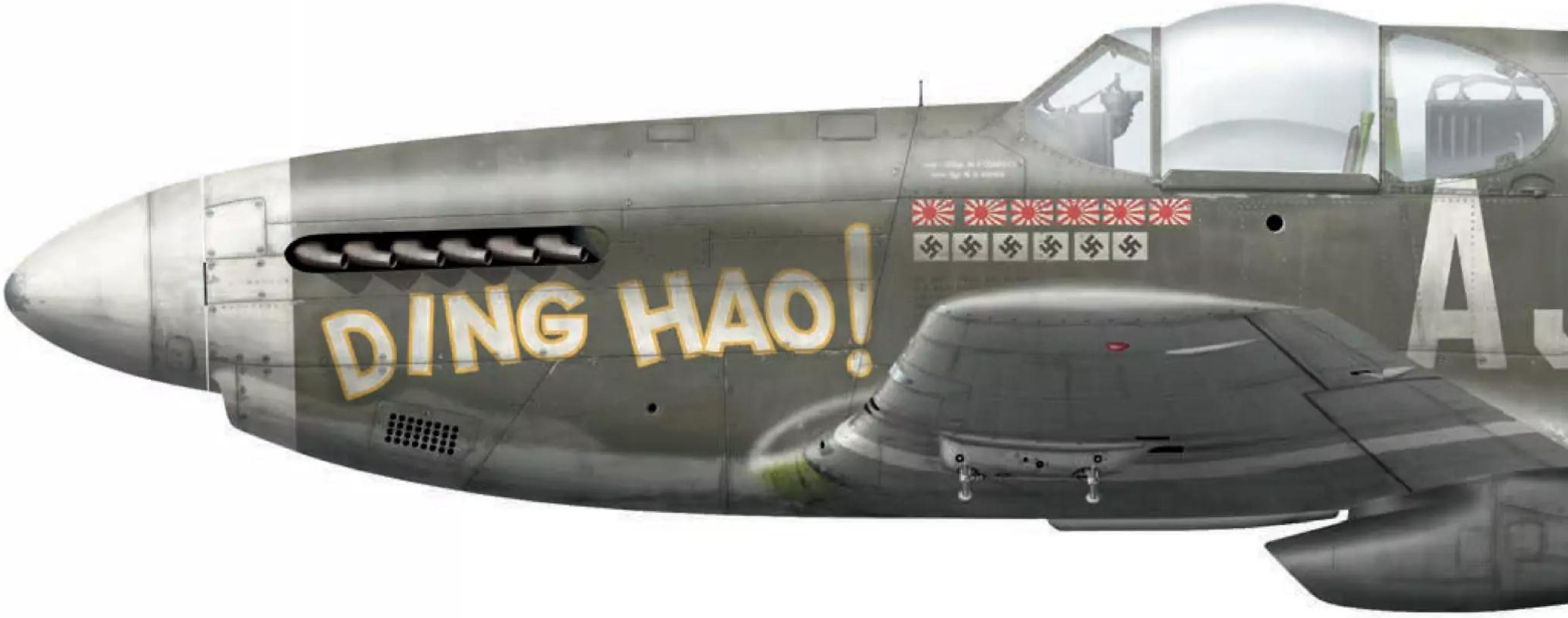
A grand total of 15,636 Thunderbolts were made in total and at an end-of-production cost of $83,000 per aircraft in 1945 it was the most expensive Allied fighter of the war. •



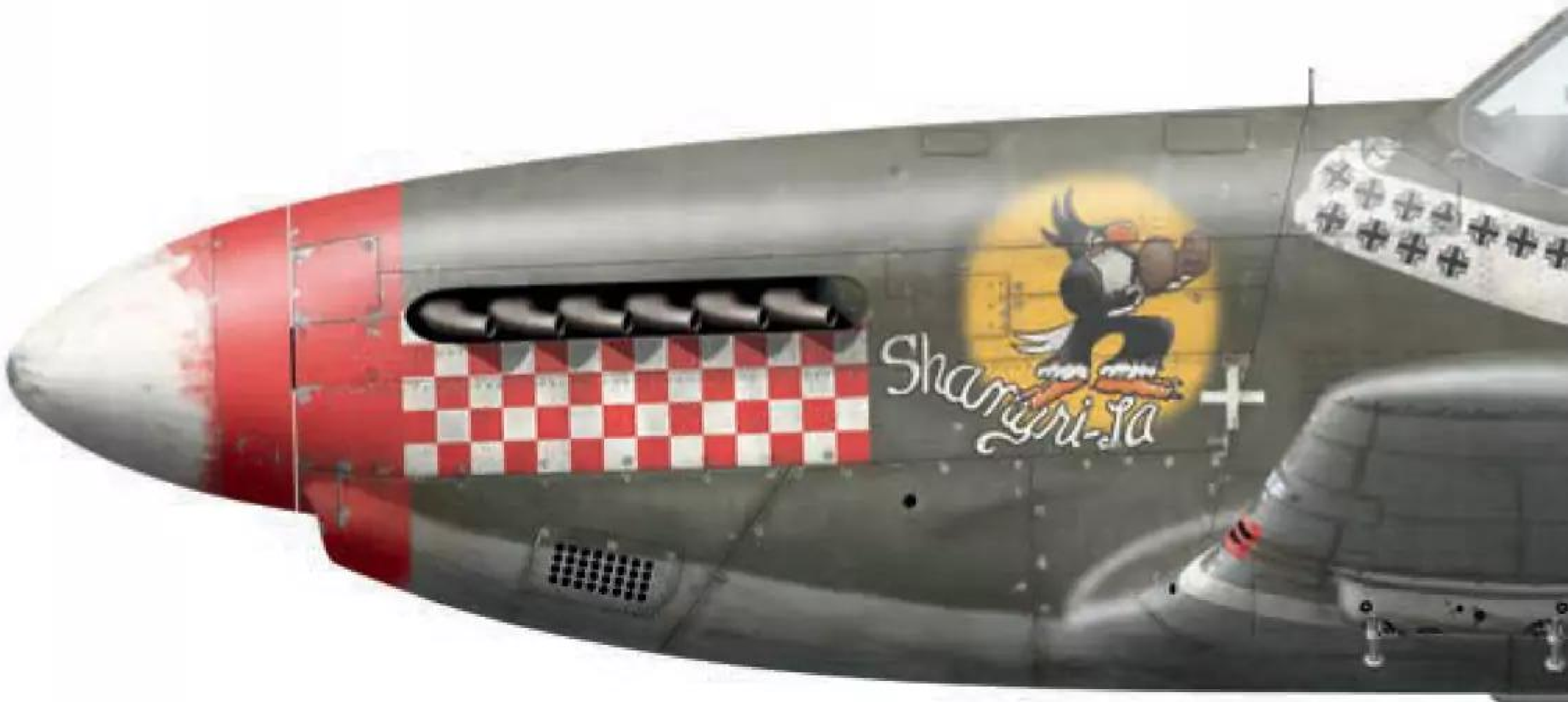
## REPUBLIC P-47D-28 THUNDERBOLT

**One of the oddest P-47 schemes belonged to 'Sigma Nu Girl' flown by Captain Charles Matheny, of the 506th FS, 404th FG, during April 1945. Sigma Nu was and still is an American university fraternity – although evidently Matheny was not a Sigma Nu alumni.**





# NORTH AMERICAN P-51 MUSTANG



1940-1984

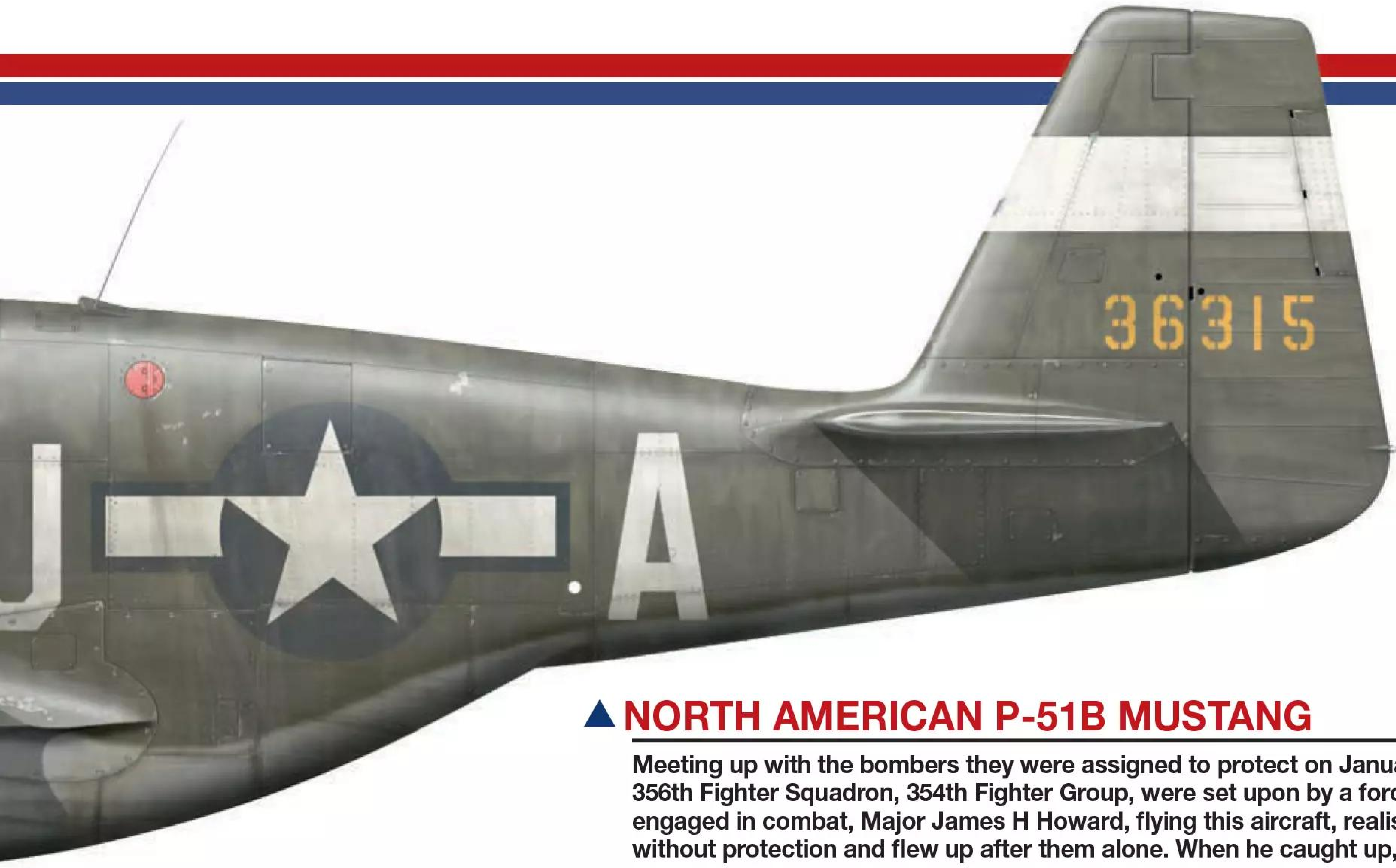
**The P-51 Mustang was most famous American fighter of the Second World War and with good reason. Particularly in its late model form it was extremely fast, highly manoeuvrable and able to fly for huge distances. In combat it earned the admiration of its pilots and inspired fear in their opponents.**

During 1939, the newly formed aircraft design team at North American Aviation – founded as a holding company in 1928 and only becoming a genuine manufacturing concern 10 years later – quietly began work on a new fighter aircraft.

At around the same time, the US Neutrality Act of 1939 featured a 'cash and carry' clause which effectively allowed the British and French, for the first time, to buy American arms as long as they could provide their own ships to take them away. As a result in early 1940 an Anglo-French purchasing commission was established in the US to work out what the two nations should buy.

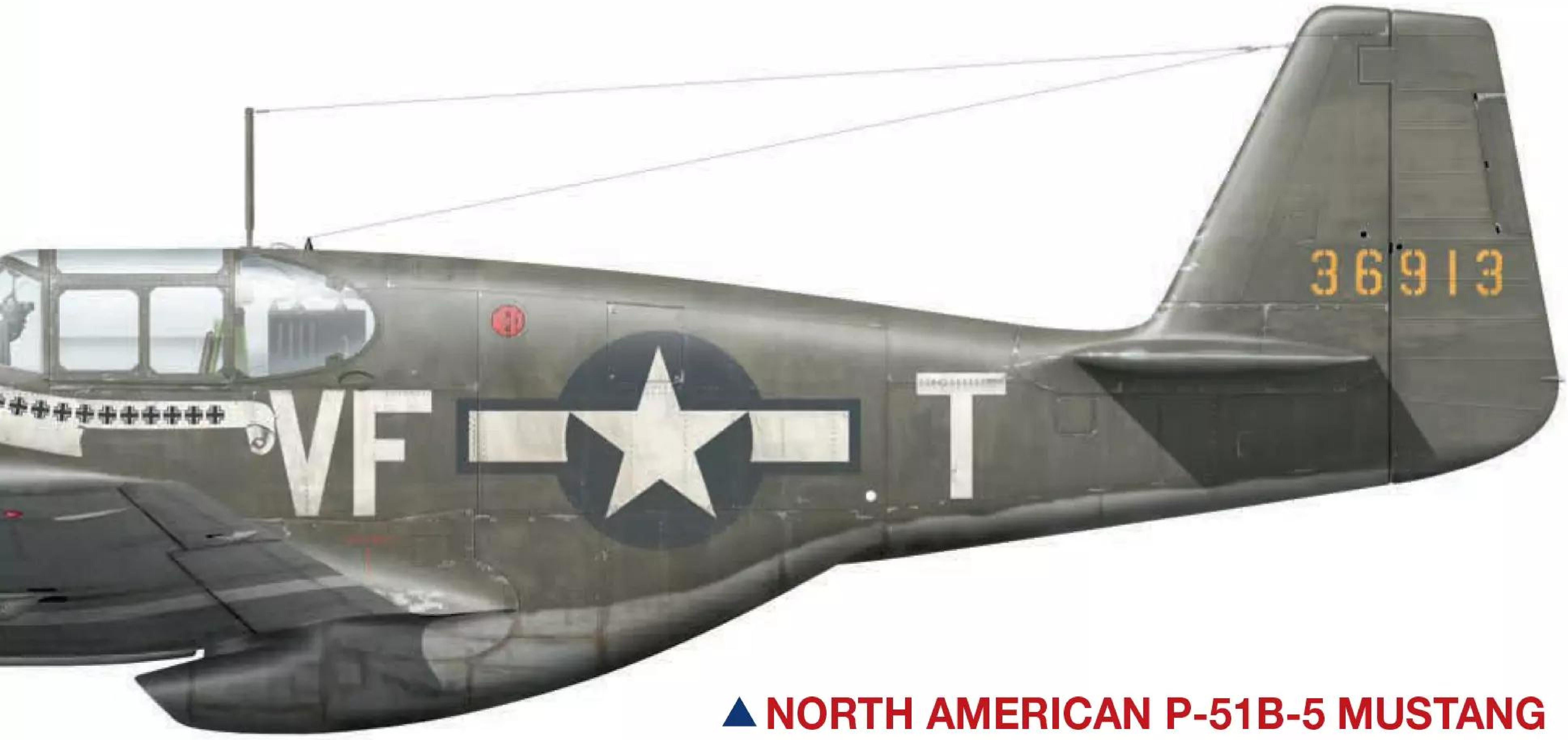
Attention soon focused on the Curtiss P-40 and Lockheed's P-38, although the former fell some way short of the state-of-the-art in fighter design at that time and the latter would not be ready to 'carry' for months or even years. The Bell P-39 was also a strong contender for sales.

North American Aviation was able to sell its NA-16 trainer design to the British, who



**▲ NORTH AMERICAN P-51B MUSTANG**

**Meeting up with the bombers they were assigned to protect on January 11, 1944, P-51s of the 356th Fighter Squadron, 354th Fighter Group, were set upon by a force of Bf 110s. With his men engaged in combat, Major James H Howard, flying this aircraft, realised that the bombers were without protection and flew up after them alone. When he caught up, he realised they were already being attacked by a group of Bf 109s. Rather than wait for his men, Howard single-handedly attacked a formation of more than 30 German fighters. He destroyed at least three of them before running out of ammunition yet continued to dive on the Bf 109s to try to make them break off their attacks. It sounds far-fetched but there were dozens of witnesses to Howard's heroic aboard the bombers and he was later awarded the Medal of Honor. He survived the action and the war, eventually becoming a brigadier general in the USAF Reserve.**



**▲ NORTH AMERICAN P-51B-5 MUSTANG**

**After becoming the 8th Air Force's top scoring ace by shooting down three Fw 190s on April 8, 1944, Captain Dominic Salvatore 'Don' Gentile of the 336th FS, 4th FG, was in the mood to celebrate. On April 13, 1944, he took off in his personal P-51 'Shangri La' to perform some stunts over his unit's base at Debden in England. Unfortunately, he crashed in front of a pack of press reporters and a firm crew and was grounded by his unit commander. During the war he achieved a total of 21.83 victories in air combat plus six on the ground. Afterwards, he became a test pilot but died on January 28, 1951, aged 30, when his T-33 Shooting Star trainer crashed.**

renamed it the Harvard, but could not persuade them to buy its B-25 bomber. With the other firms landing contracts worth millions of dollars in a veritable sales bonanza, North American decided it was time to put its earlier fighter work to good use.

Knowing that the British were interested in the P-40 but were struggling to buy it due to Curtiss's production lines being over-stretched, North American offered what it described as a better fighter, the NA-73, which could be ready as early as January 1941. Having seen the company's designs, the British placed an order for a prototype on May 23, 1940. Six days later, an order for 320 full production examples was placed but only on condition that the prototype proved to be satisfactory during testing.

Despite the pressing timescale, the North American team incorporated a number of advanced features into the NA-73. Firstly, it was to have a very thin laminar flow wing developed by the National Advisory Committee for Aeronautics or NACA, which generated very little drag at high speed. Secondly, it was to have a novel cooling system which was positioned towards the rear of the fuselage and used a single duct for both water and oil radiators – again reducing drag.

The design was also drawn up specifically with mass production in mind, the airframe divided up into five sections which would each be almost completed in their own right before being married up at final assembly. The more usual production method was simply to build an airframe in situ from the ground up.

With an all-aluminium fuselage, the NA-73 was to be armed with four .303 machine guns, two in each wing, plus two .50 cal machine guns mounted below the engine which fired through the propeller.

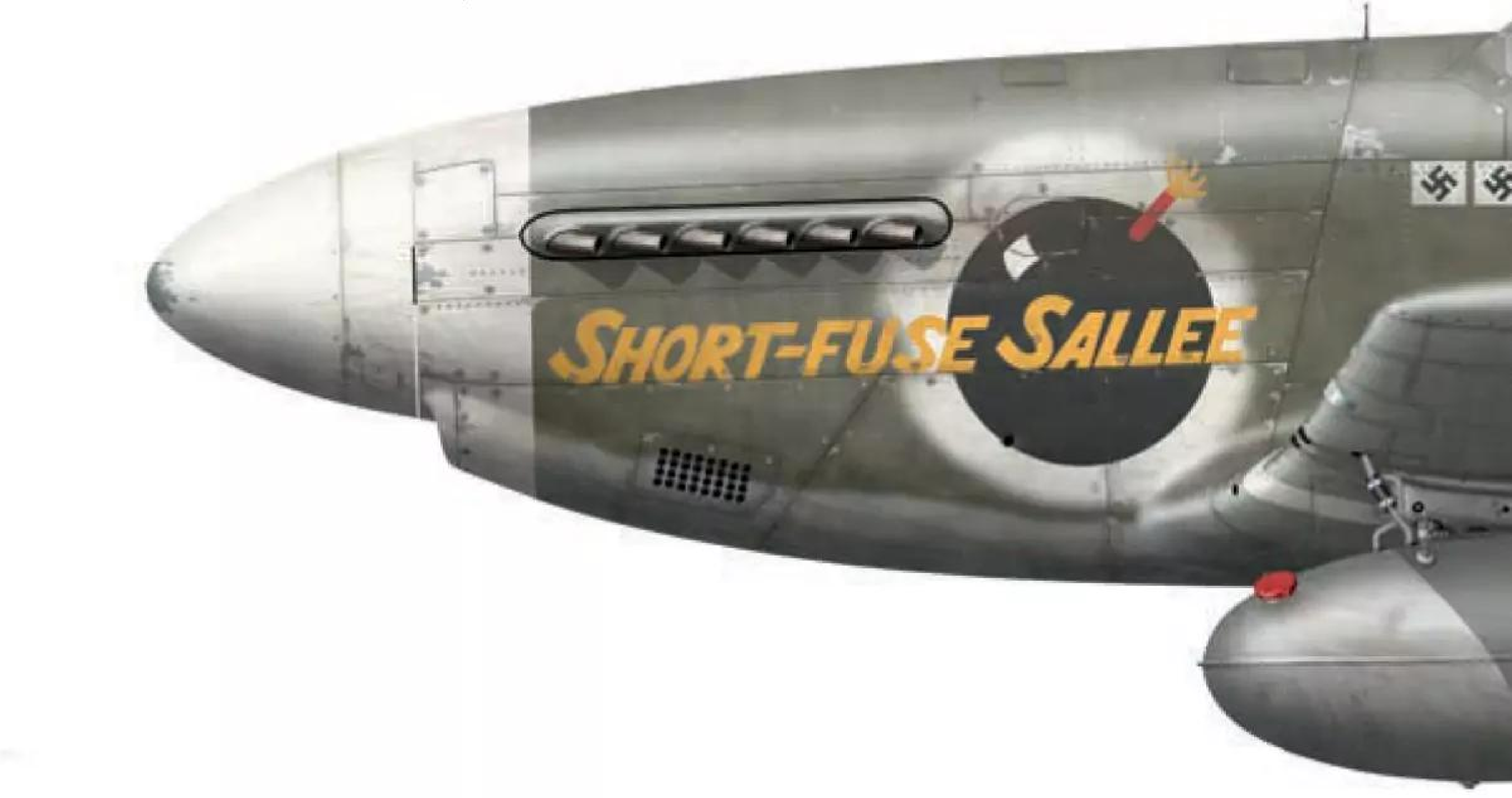
One hundred and two days after the order was placed, the prototype NA-73 was rolled out as the NA-73X, ready for engine installation and final assembly. With a non-supercharged 1100hp Allison V-1710-39 installed it made its first flight on October 26, 1940, receiving praise for its easy handling and low-altitude performance.

A member of the British purchasing commission named the aircraft Mustang Mk.I and a second additional contract was awarded for another 300 Mustang Mk.Is, now designated NA-83 by North American. The company began the process of establishing production and supply lines for the new fighter.

THE MUSTANG WAS DESIGNED AT THE BEHEST OF THE BRITISH

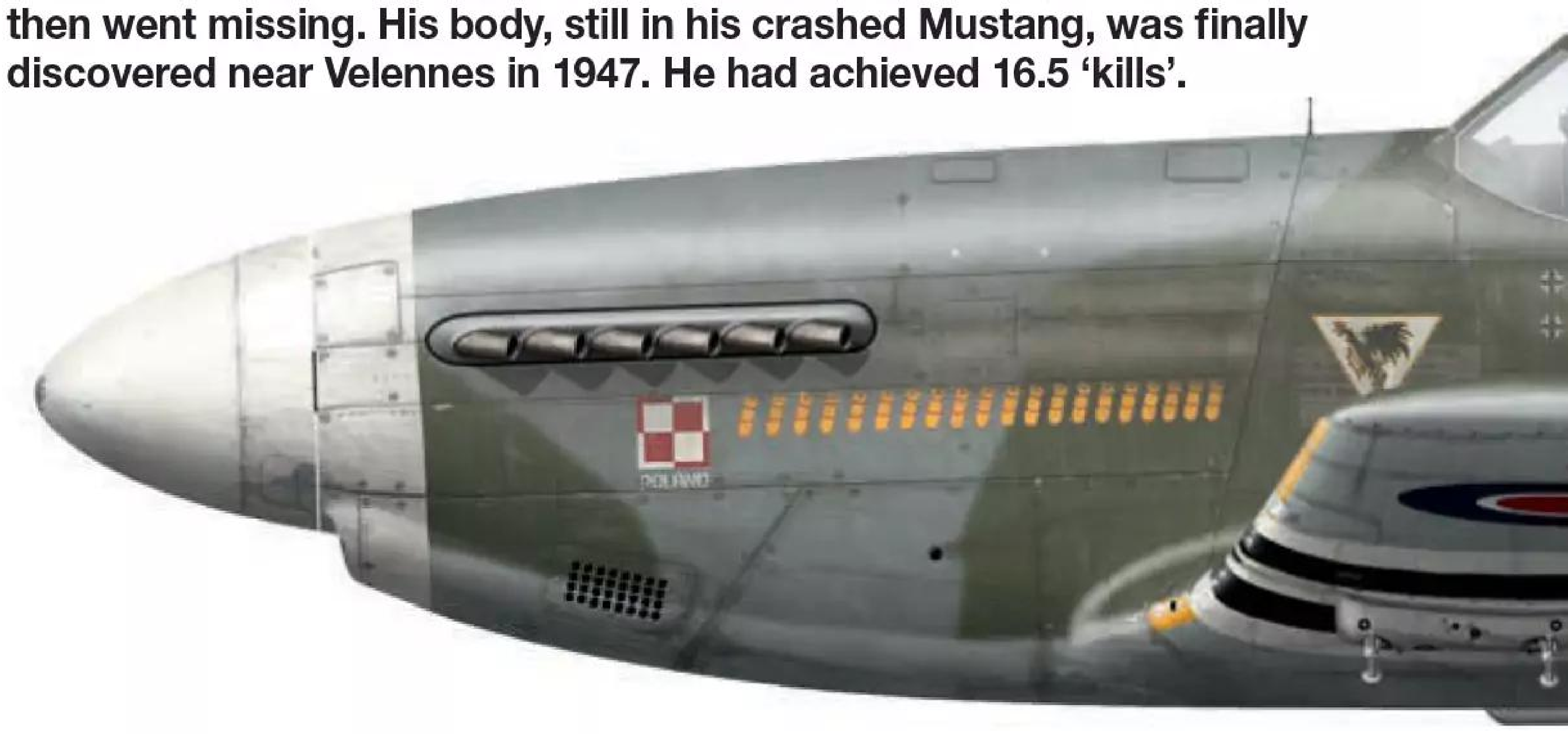
## NORTH AMERICAN P-51B-1 MUSTANG ▼

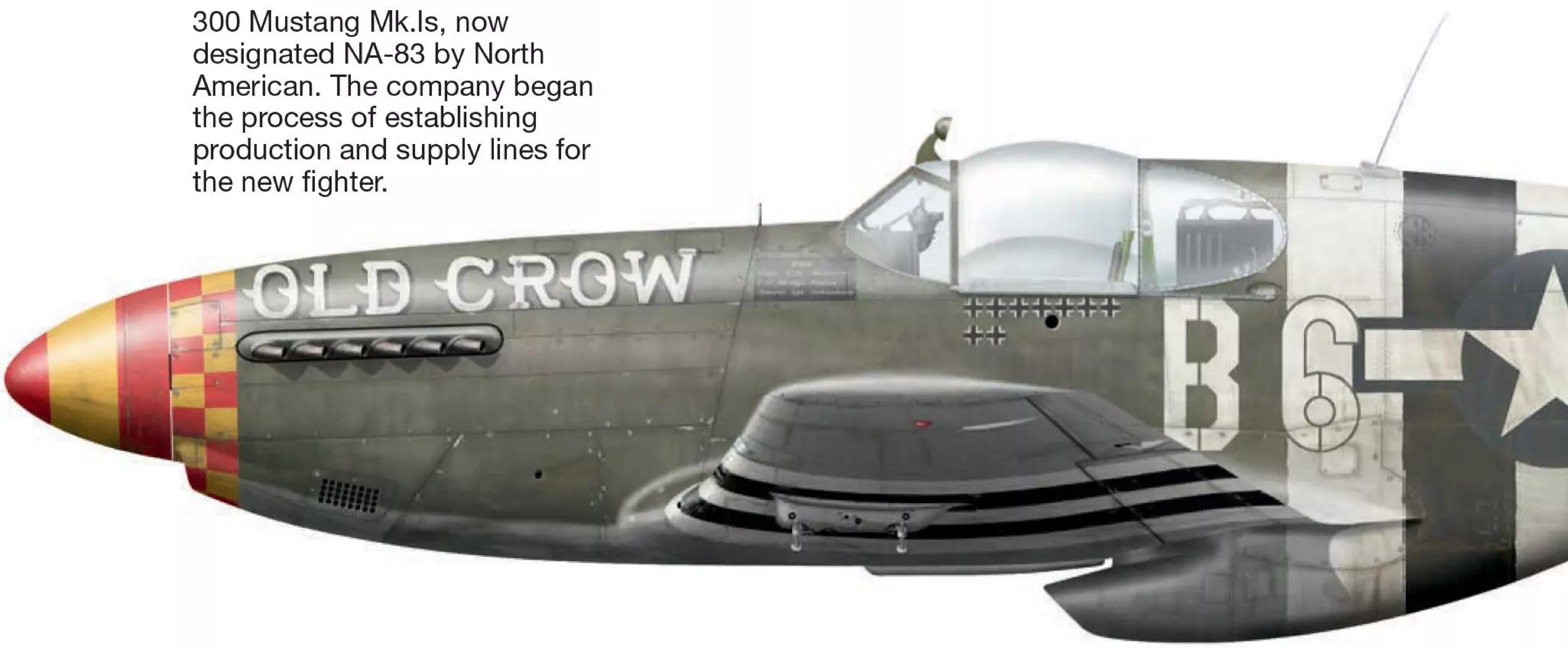
**This aircraft was flown by Captain Richard E Turner, commanding officer of the 356th FS, 354th FG, stationed at Lashenden, England, during May 1944 – shortly before his promotion to major. Turner flew 96 combat sorties and achieved 11 victories in air combat, plus two V-1 flying bombs destroyed. He later flew 13 combat missions during the Korean War while attached to the 4th FIW. Later in life he suffered from Alzheimer's Disease and died on November 15, 1986.**

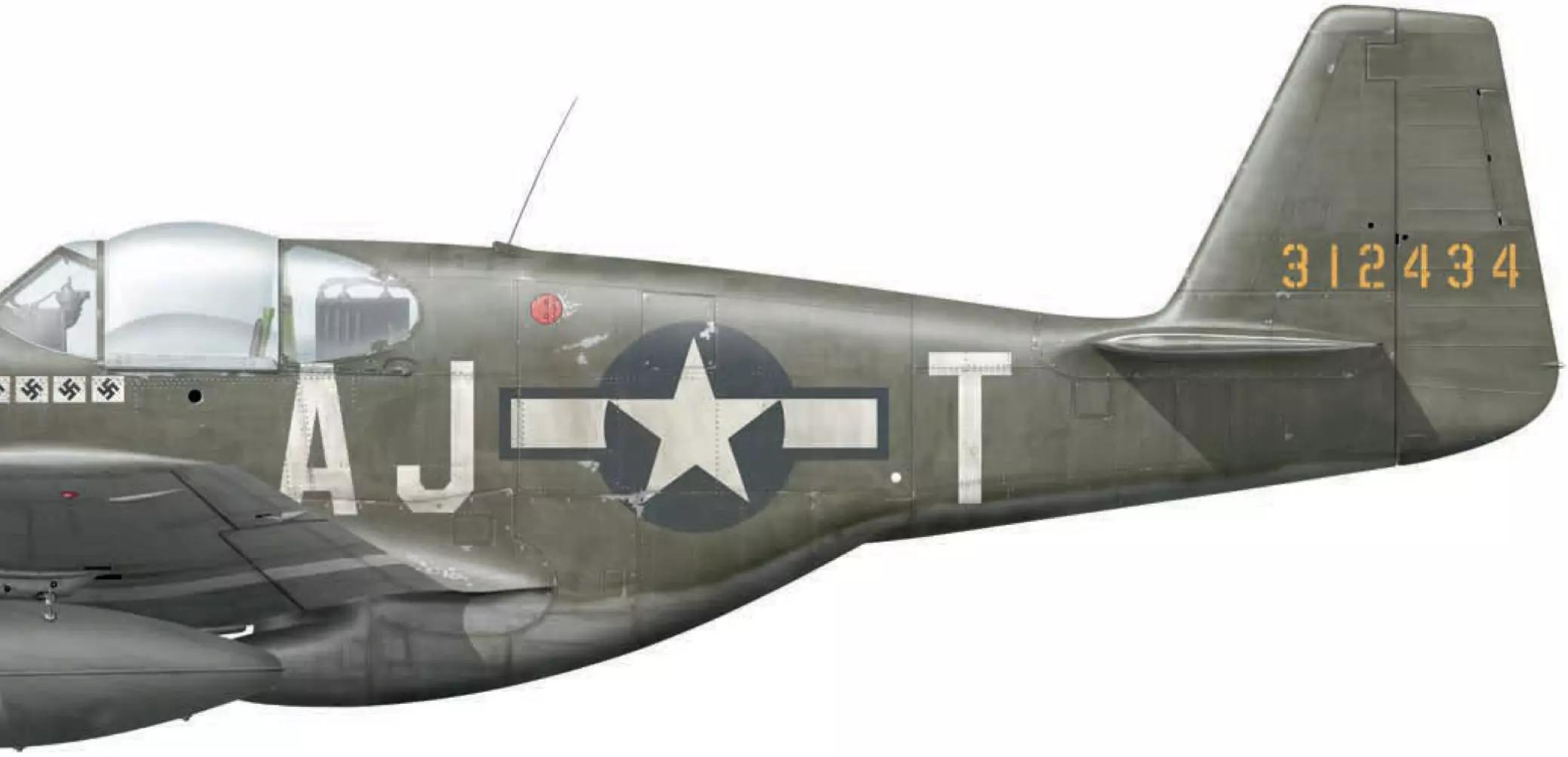


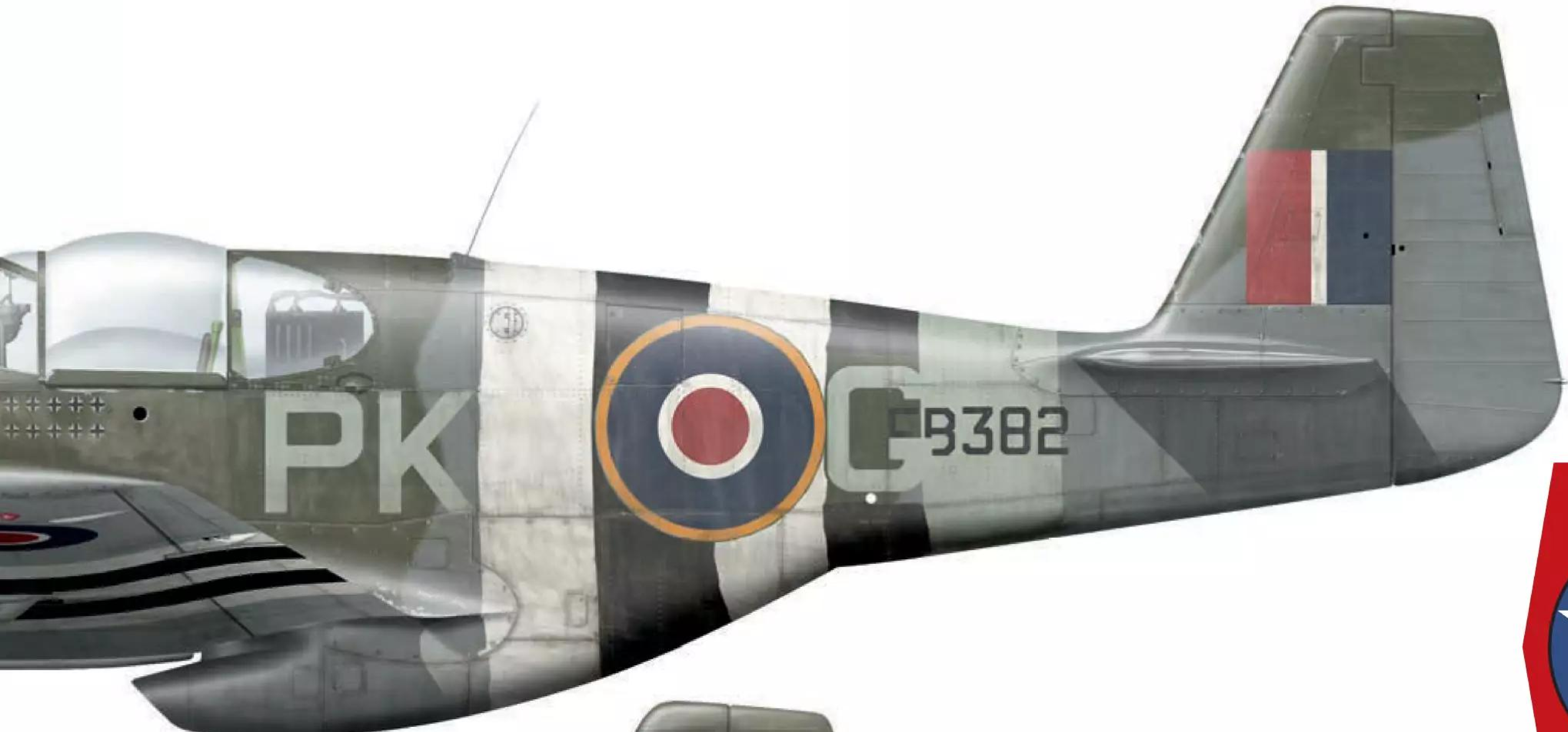
## NORTH AMERICAN P-51 MUSTANG MK.III ▼

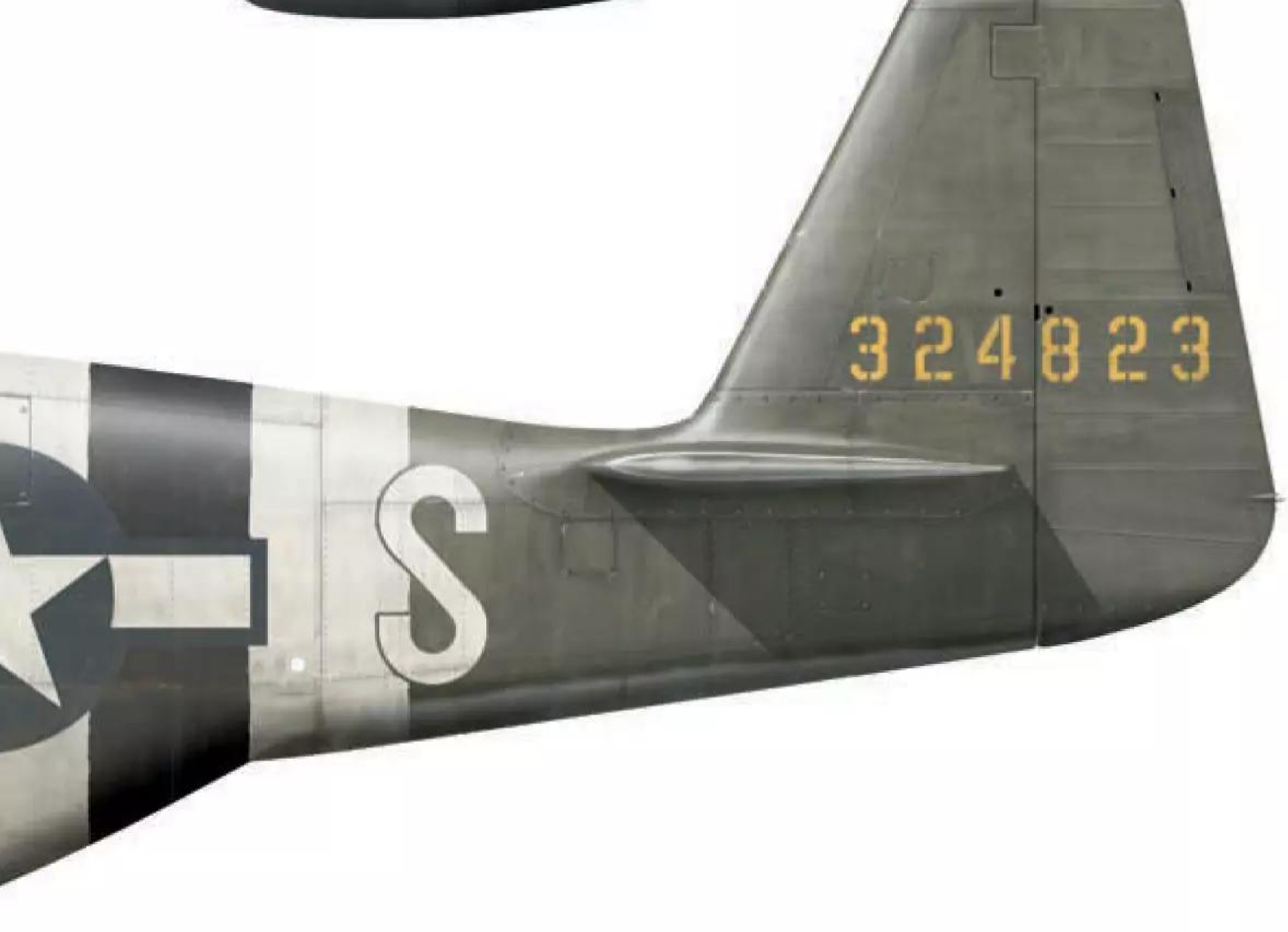
**A Fw 190 was shot down by Squadron Leader Eugeniusz 'Dziubek' Horbaczewski of 315 (Polish) Squadron, stationed at Coolham in England, on June 12, 1944, while flying this Mustang Mk.III. On August 18 that year, despite suffering from the flu, Horbaczewski led a 'Rodeo' mission with 11 other aircraft and attacked a formation of 60 Fw 190s near Beauvais, northern France. Horbaczewski shot down three enemy aircraft but then went missing. His body, still in his crashed Mustang, was finally discovered near Velennes in 1947. He had achieved 16.5 'kills'.**











## NORTH AMERICAN P-51C-10 MUSTANG

**'Old Crow' carried Captain Clarence E 'Bud' Anderson of the 363rd FS, 357th FG, through 116 combat missions without ever once being hit by enemy fire or suffering a mechanical failure which caused him to have to return to base. On June 29, 1944, the point at which 'Old Crow' is depicted here, Anderson shot down a trio of Fw 190s while defending B-17s on a bombing mission over Leipzig. Overall, Anderson achieved 16.33 victories in air combat and at the time of writing was still alive aged 95.**

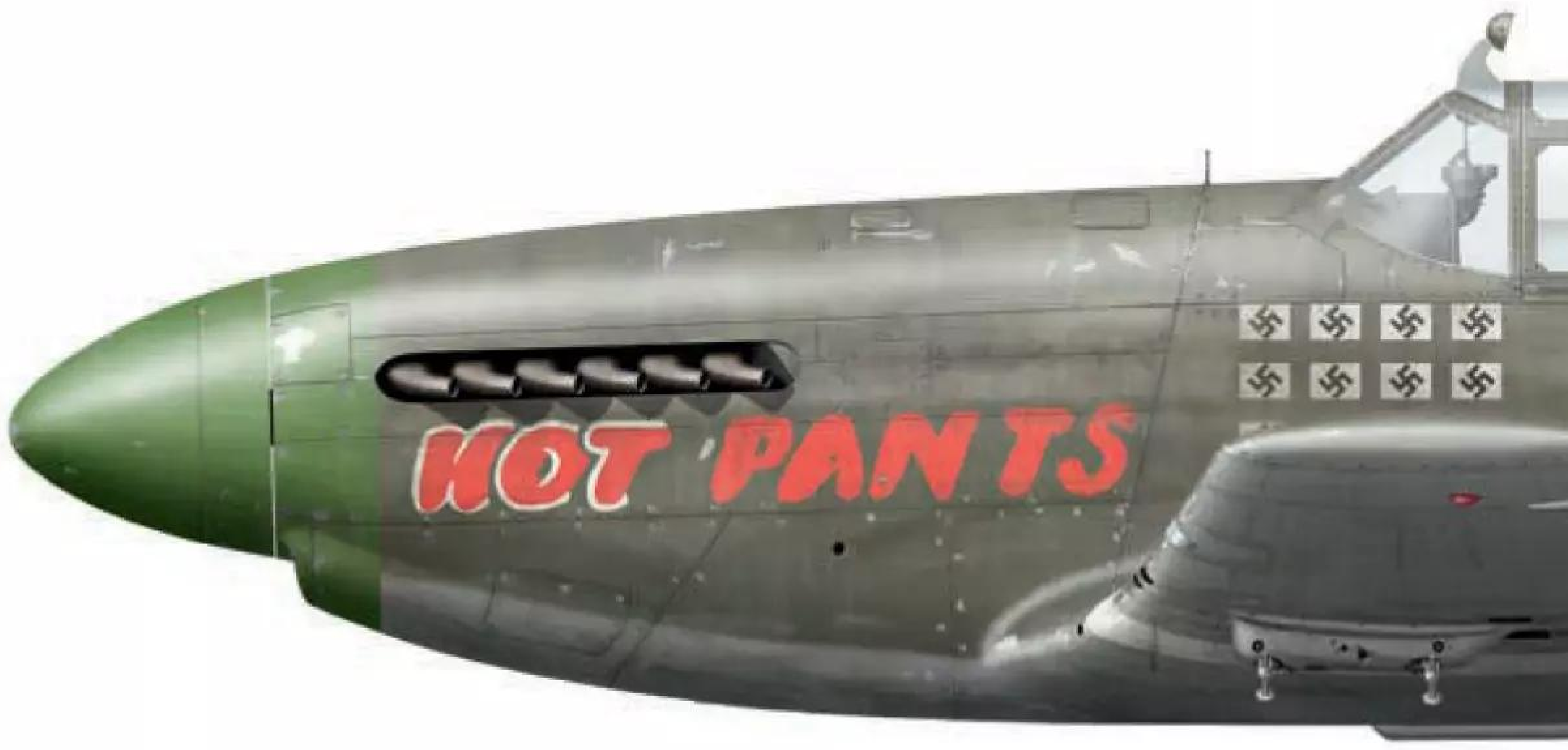
As part of the contractual arrangement that allowed the British to actually commission a new fighter from scratch, the US Army Air Corps was entitled to a pair of production model examples for assessment. These received the designation XP-51 and were duly delivered to Wright Field in May 1941 for testing. This was slow to begin since the centre was already working on the P-38, P-39 and P-47, but when it did get under way pilots gave very favourable reports on the new type. No production orders were forthcoming, however, until April 1942.

In the meantime, the Mustangs bought by the British entered service in January 1941 with 26 Squadron. Despite having not ordered any, the Americans received their first Mustangs in December 1941 shortly after the attack on Pearl Harbor when newly-made RAF Mustang Mk.IAs that were still waiting to be delivered were seized for use by the USAAC. Earmarked for tactical reconnaissance duties, they were fitted with a pair of K-24 cameras in their fuselages and designated F-6A, although this was soon dropped in favour of P-51.

When the Army finally did place an order for the Mustang, it was for 500

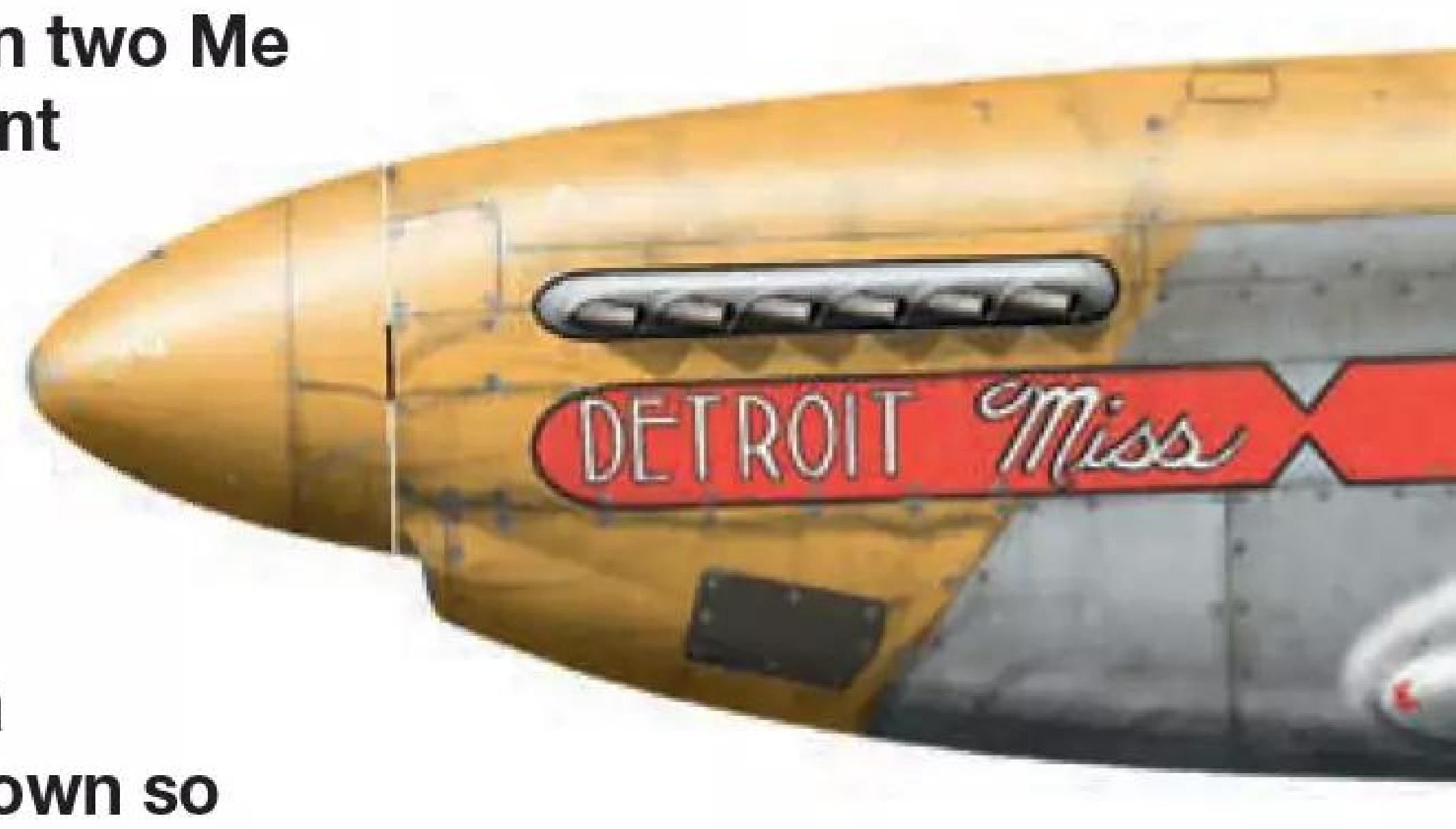
## NORTH AMERICAN P-51B-5 MUSTANG ▼

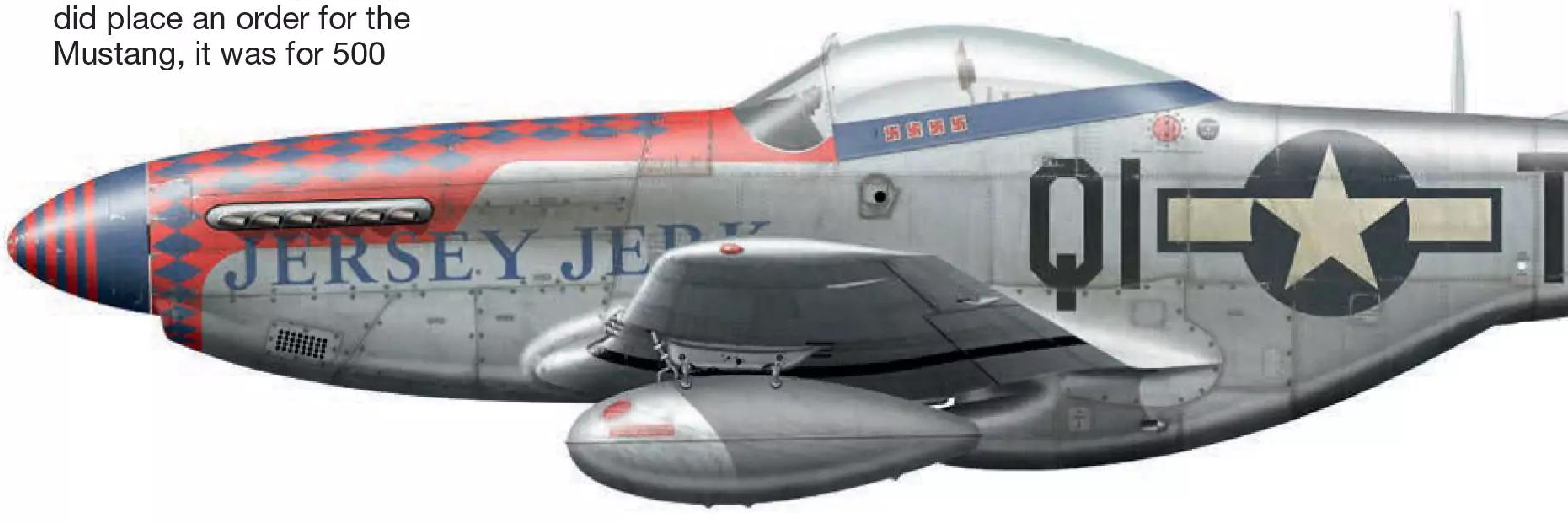
**This P-51B was flown by 1st Lieutenant Wilson K Baker Jr. of the 370th FS, 359th FG, stationed at East Wretham, in England, on August 4, 1944. Baker achieved two victories in air combat.**

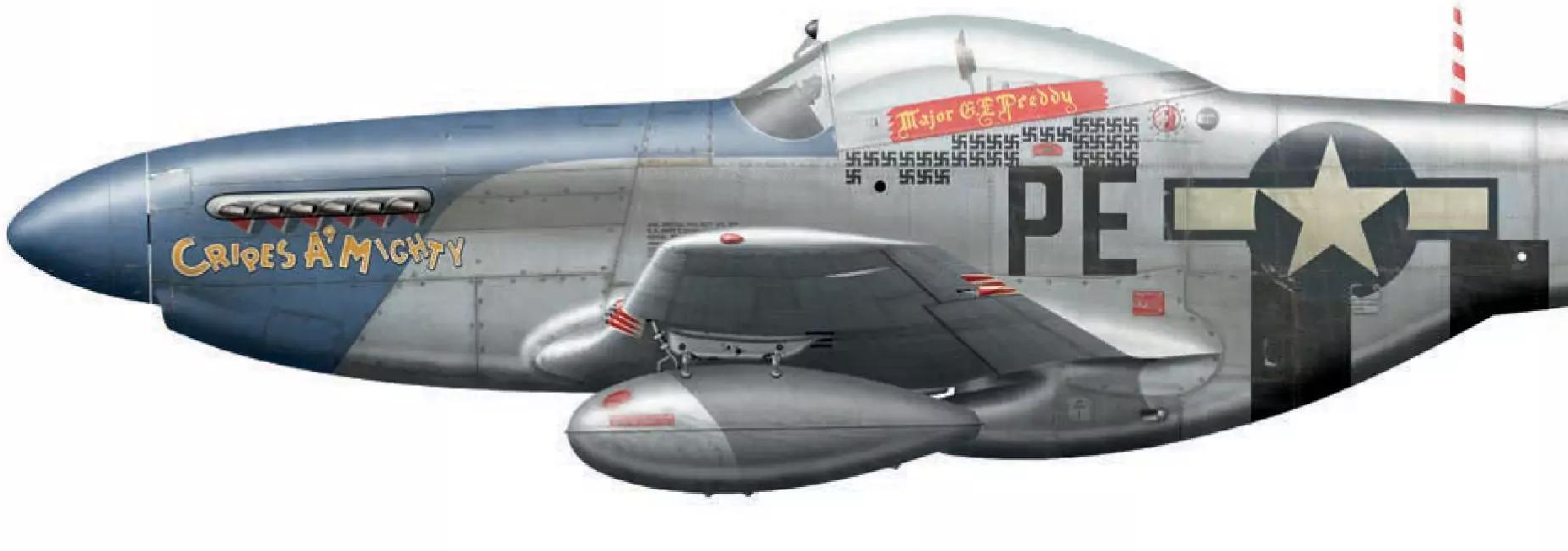


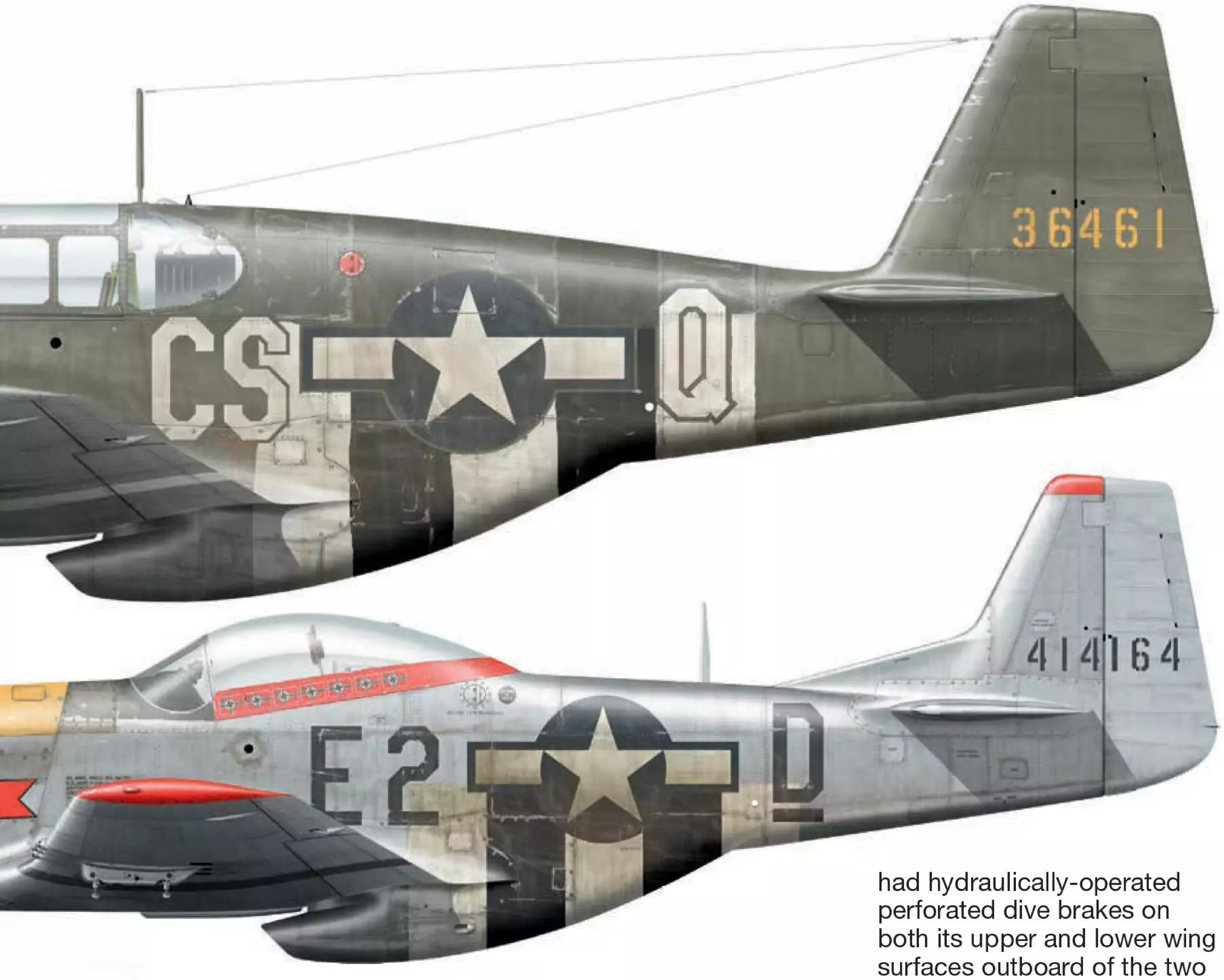
## NORTH AMERICAN P-51D-10 MUSTANG ▼

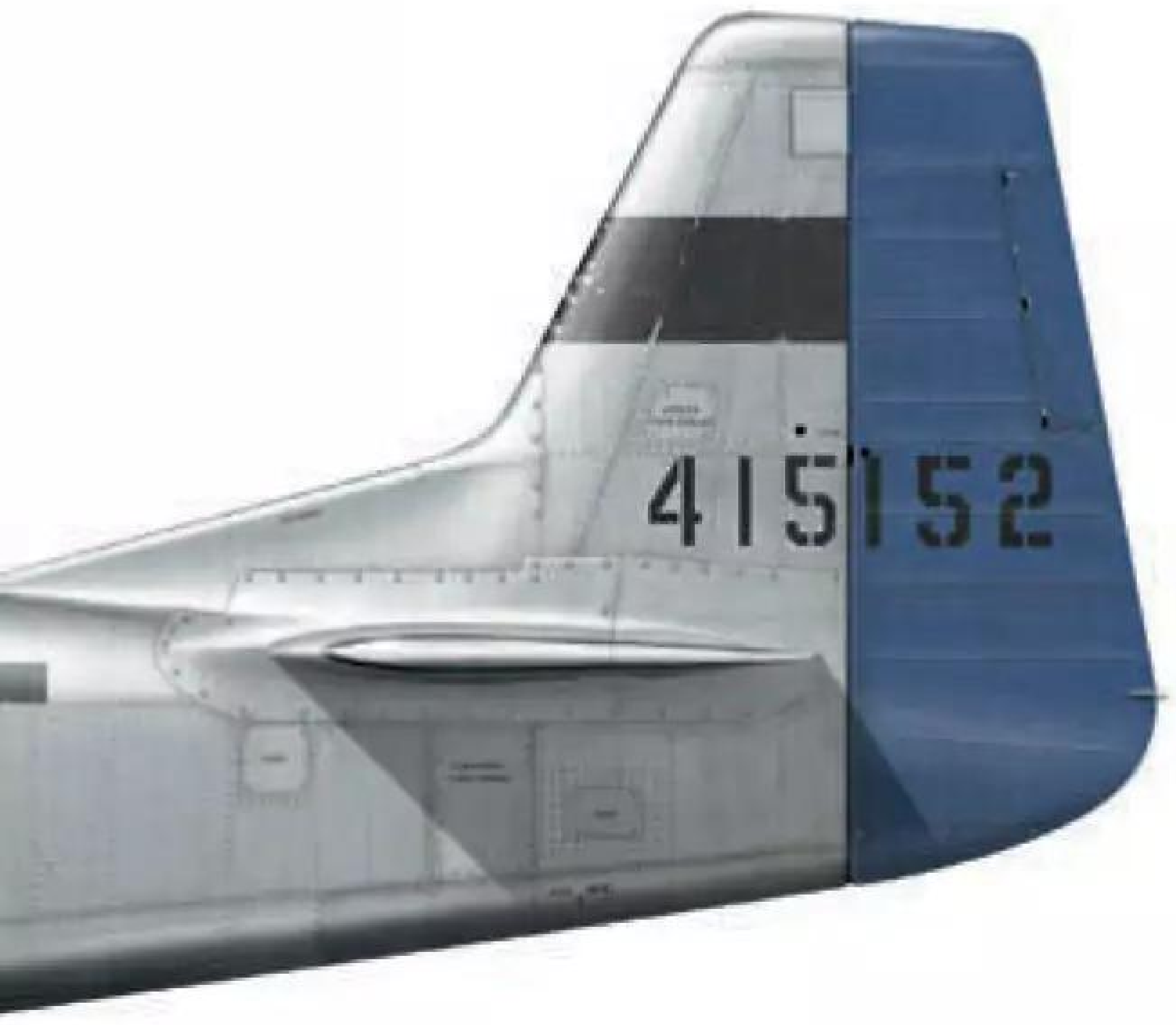
**The only P-51 pilot ever to shoot down two Me 262s in a single mission was Lieutenant Urban L 'Ben' Drew of the 373rd FS, 361st FG, based at Little Walden, England. This is how his aircraft appeared on the day he attacked the jet fighters – October 7, 1944. Although Drew reported his victories, his gun camera jammed and his wingman was shot down so the authorities denied his claim. It was only 40 years later, when they were fully investigated and corroborated, that he finally received credit and the Air Force Cross. Overall he flew 76 combat sorties with six victories in air combat plus one on the ground. He also destroyed 11 locomotives. He died on April 3, 2013, aged 89.**











## NORTH AMERICAN P-51D-15 MUSTANG

**Hailing from Verona, New Jersey, Captain Donald J Strait of the 361st FS, 356th FG, stationed at Martlesham Heath, England, named his aircraft in honour of his home town. It is depicted as it appeared on December 5, 1944, a day when Strait scored two victories. He ended the war with 13.5 in total.**

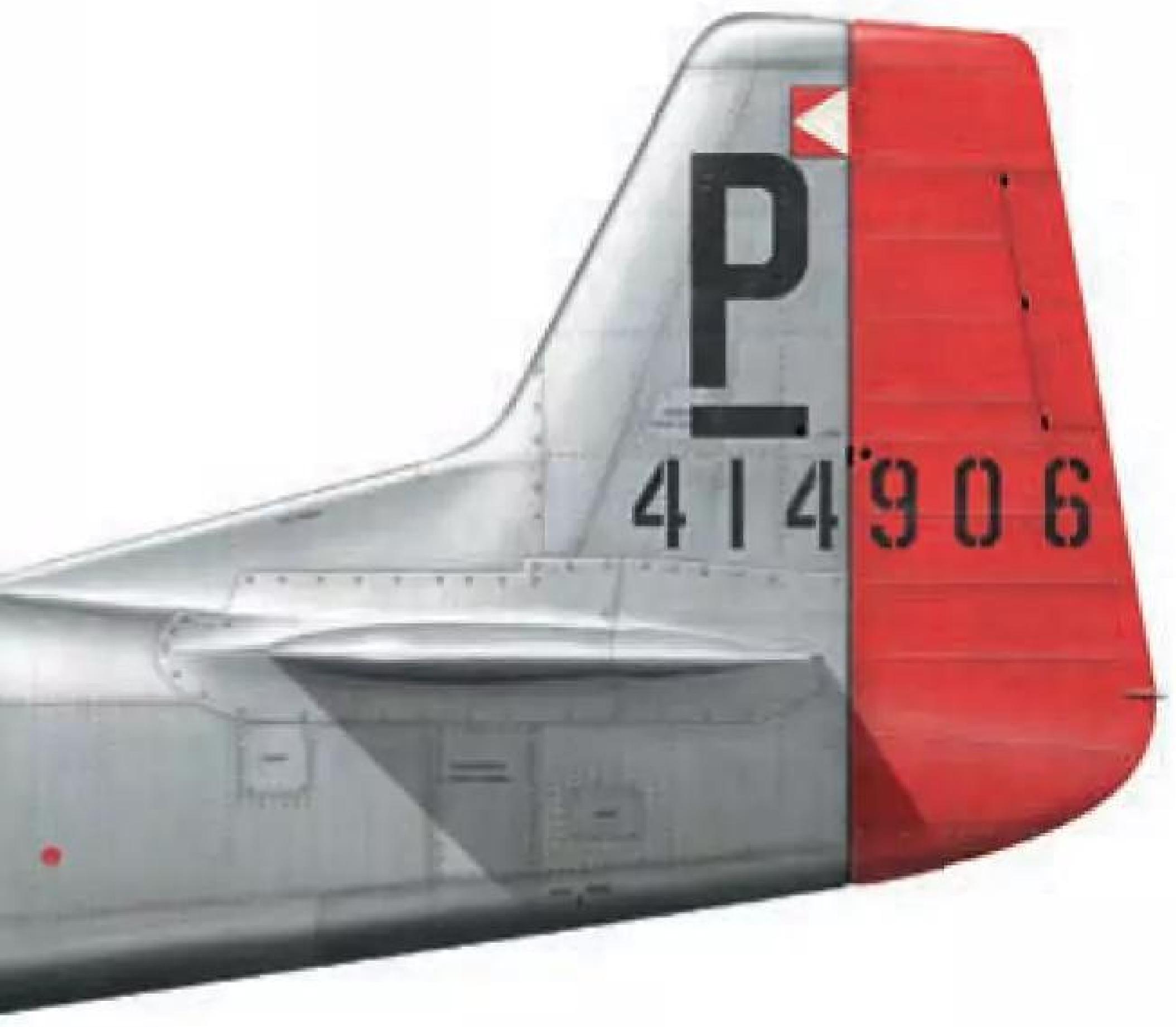
examples of the NA-97 ground-attack version, which was designated A-36A. This was given the name Apache at first, then attempts were evidently made to change it to Invader before the Army finally settled on simply calling it by its British name, the Mustang. Unlike the earlier models, however, the A-36A had hydraulically-operated perforated dive brakes on both its upper and lower wing surfaces outboard of the two .50in guns. These opened via a hydraulic jack to keep dive speeds down to 250mph and in keeping with the type's ground-attack specification a rack was fitted under each wing for a 500lb bomb, a 75 gallon drop tank or equipment for emitting a smoke curtain.

In addition to the four wing guns, there were another two .50in guns mounted in the lower fuselage nose although these were often removed in the field.

The engine was a 1325hp Allison V-1710-87 and with a full payload the A-36A had a range of 550 miles and a service ceiling of 25,100ft.

On July 25, 1942, North American fitted a pair of Mustangs from the 'seized' British batch with Rolls-Royce Merlin 65 engines shipped over

**THE AMERICANS DID NOT ORDER THE P-51 IN QUANTITY TILL AUGUST 1942**



## NORTH AMERICAN P-51D-15 MUSTANG

**The highest scoring P-51 ace of the war, Major George E Preddy, commanding officer of the 328th FS, 352nd FG, stationed at Asch in Belgium, flew this aircraft on the morning of Christmas Day 1944. Attacking a Fw 190 that had been strafing Allied lines, Preddy's P-51 was hit by fire from a US Army anti-aircraft battery while flying at treetop height. He managed to release the canopy, despite suffering severe injuries from .50 cal bullets, but had no time to bail out and was killed in the ensuing crash. He achieved 26.83 victories in air combat.**

from England as the NA-101. These were then given the new designation XP-78. The revised design saw the aircraft's carburettor intake repositioned beneath the nose to better suit the Merlin and the intercooler radiator added to the radiator group already fed by the scoop under the rear fuselage. The airframe was strengthened too, new ailerons were installed and the underwing racks were upgraded to take either a 1000lb bomb each or the equivalent weight drop tank. A new four-bladed Hamilton Standard hydromatic propeller was also fitted and the full production version of the XP-78 was to be redesignated P-51B.

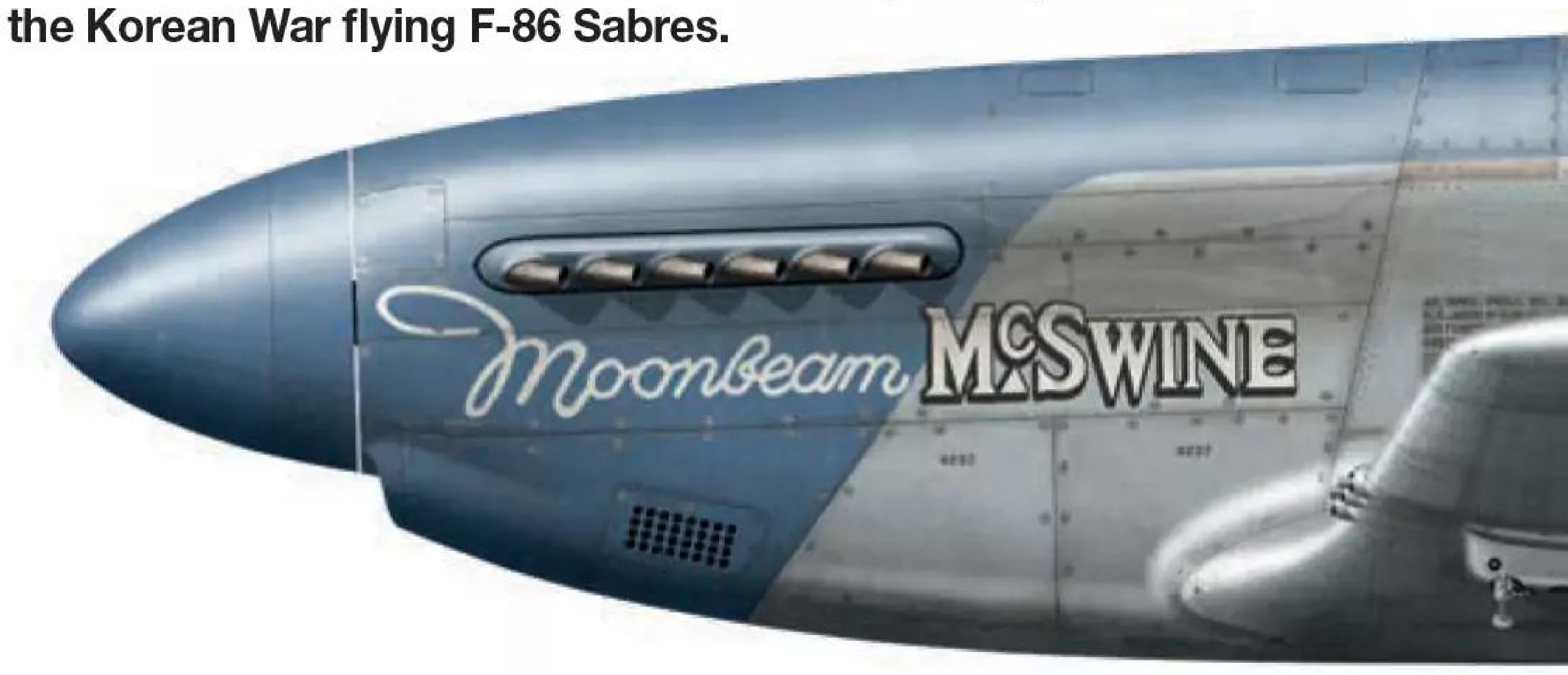
With the first A-36As approaching completion, on August 24, 1942, the Army placed an order for 1200 North American NA-99s – the P-51A. It also placed an order for 400 P-51Bs based on North American's performance estimates. The first A-36A flew the following month and on November 30, 1942, the first XP-78 flew for the first time. Its performance, albeit without armament, was a revelation with 441mph being achieved in level flight at 29,800ft. Rate of climb had doubled.

As 1943 began, the production of Merlins at Packard in Detroit and Continental in Muskegon increased dramatically, as did Mustang production. North American's ever-growing factory at Inglewood, California, ceased to build B-25 Mitchells and concentrated solely on the P-51. At the same time, the company's Dallas facility opened a second Mustang production line. Those made at Inglewood retained the P-51B designation but those built at

**HUGE PRODUCTION FACILITIES WERE DEVOTED TO BUILDING THE P-51**

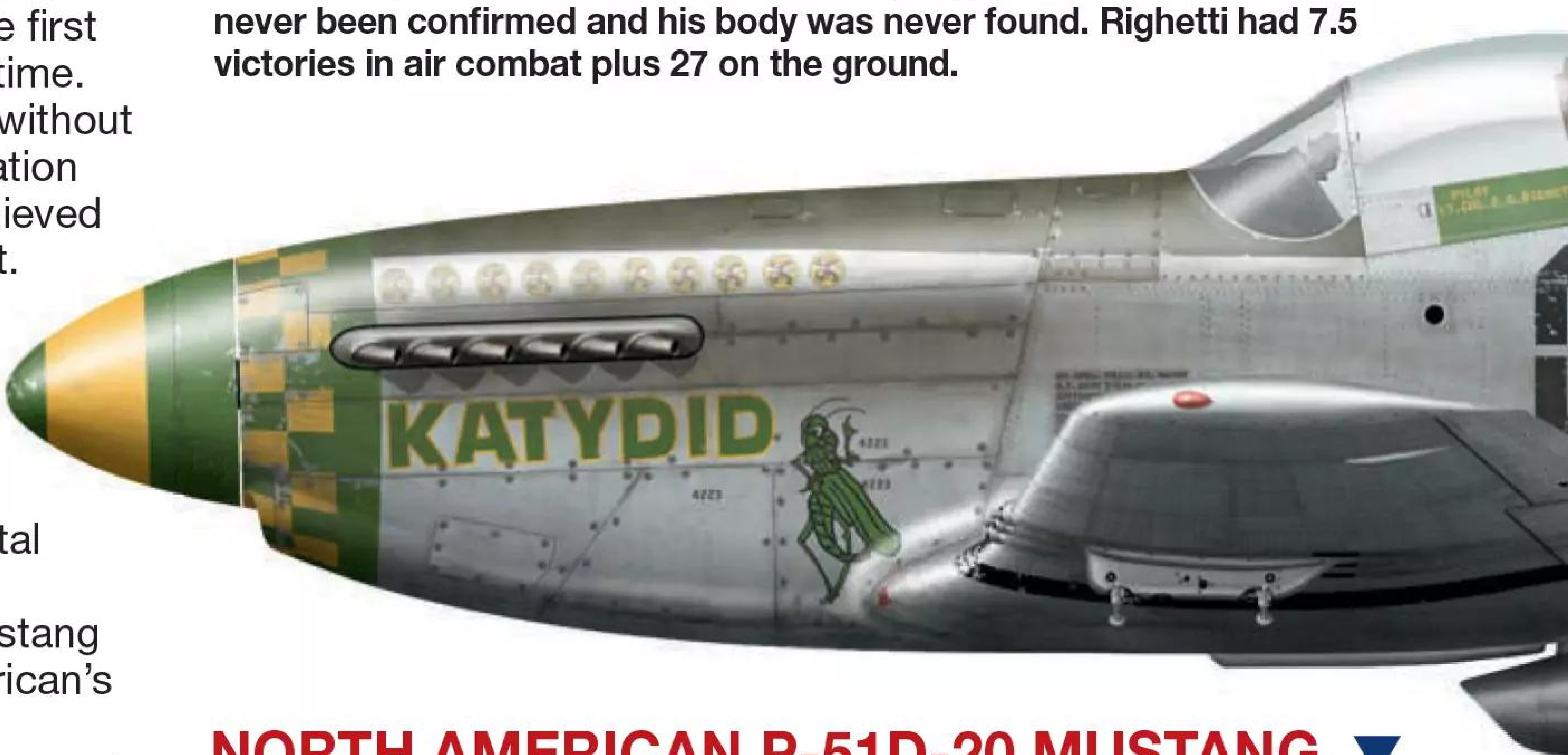
## NORTH AMERICAN P-51D-10 MUSTANG ▼

**Captain William T Whisner Jr. of the 487th FS, 352nd FG, was just about to take off from his unit's based at Asch, Belgium, on January 1, 1945, when a large formation of Fw 190s and Bf 109s appeared overhead and started attacking the airfield. This was the German Operation Bodenplatte – a last ditch attempt by the Luftwaffe to knock out the Allies' fighter forces on the ground. Whisner managed to get airborne and shoot down a Fw 190 before he was hit by 20mm cannon fire – resulting in his windscreen and canopy being cover with oil and one aileron being damaged. Nevertheless, he continued to fight and shot down another Fw 190 and two Bf 109s. He ended the war with 15.5 victories, adding another six during the Korean War flying F-86 Sabres.**



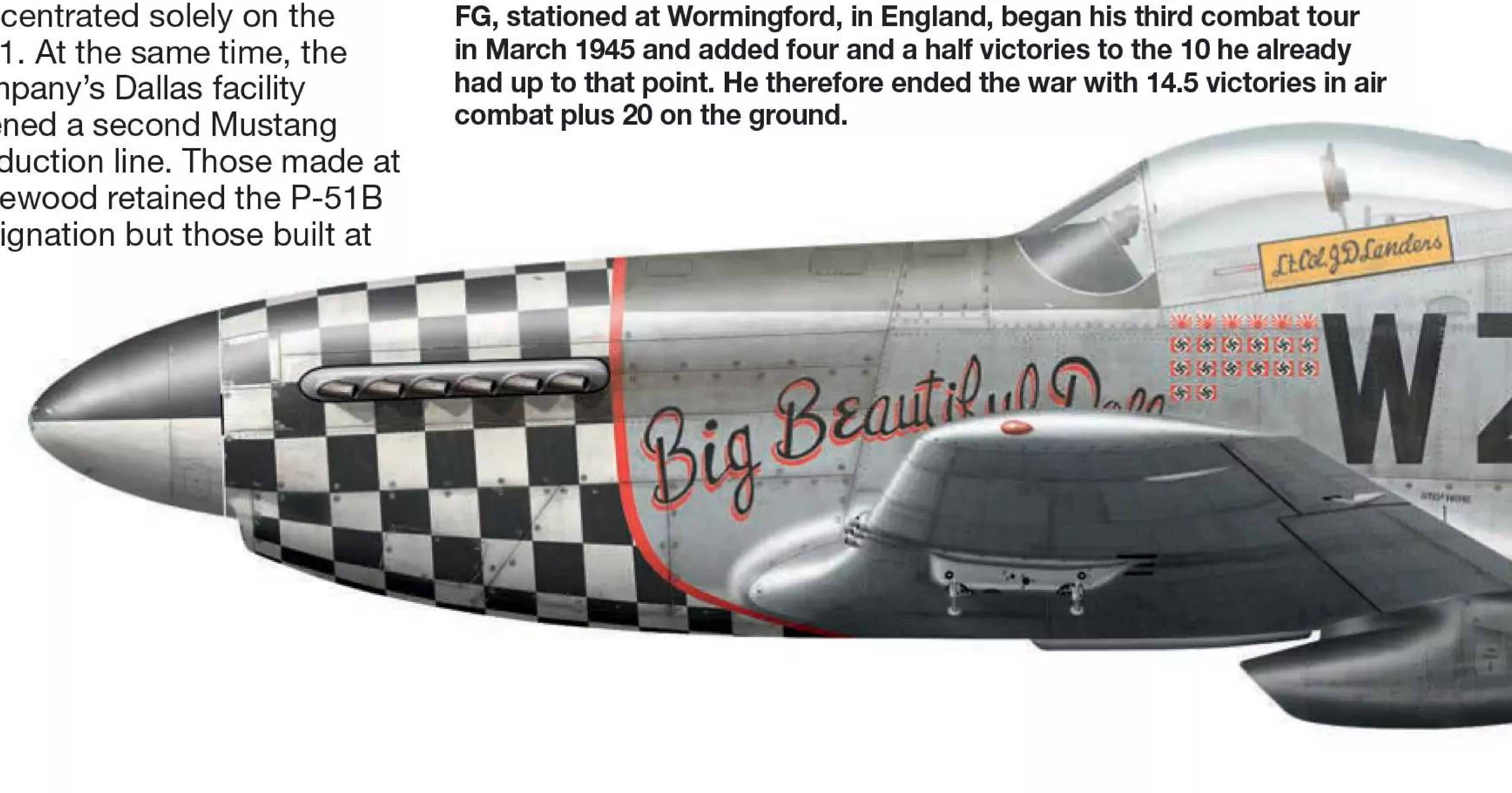
## NORTH AMERICAN P-51D-10 MUSTANG ▼

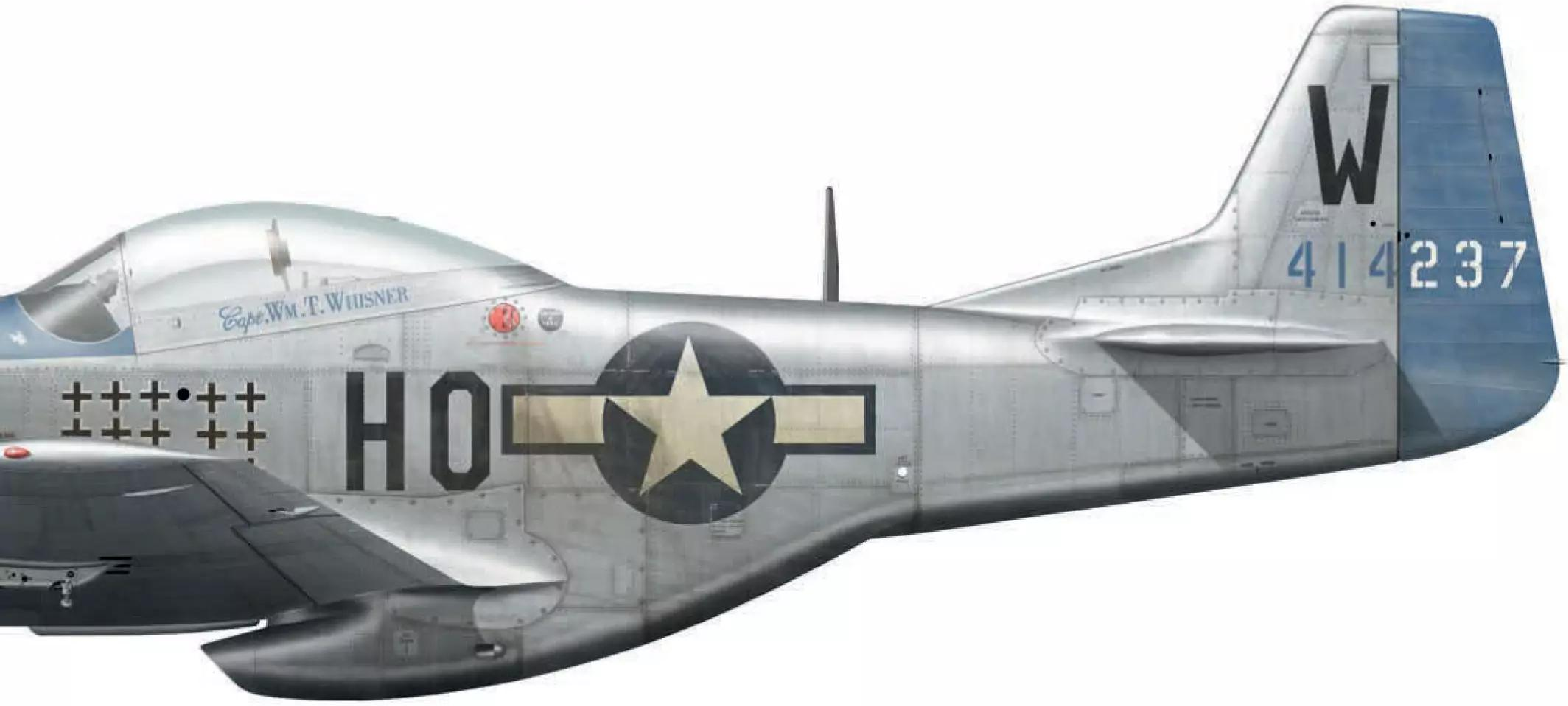
**'Katydid' was the aircraft of Lieutenant Colonel Elwyn C Righetti, commanding officer of the 55nd FG, stationed at Nuthampstead, England, and this is how it appeared in February 1945. Two months later, on April 17, 1945, Righetti was shot down while strafing a German airfield – but not in Katydid since that was being repaired. He radioed his men to say that he had survived the crash-landing but he was never seen again. It has been speculated that he was killed by angry civilians but this has never been confirmed and his body was never found. Righetti had 7.5 victories in air combat plus 27 on the ground.**



## NORTH AMERICAN P-51D-20 MUSTANG ▼

**Texan Lieutenant Colonel John D Landers, commanding officer of 78th FG, stationed at Wormingford, in England, began his third combat tour in March 1945 and added four and a half victories to the 10 he already had up to that point. He therefore ended the war with 14.5 victories in air combat plus 20 on the ground.**

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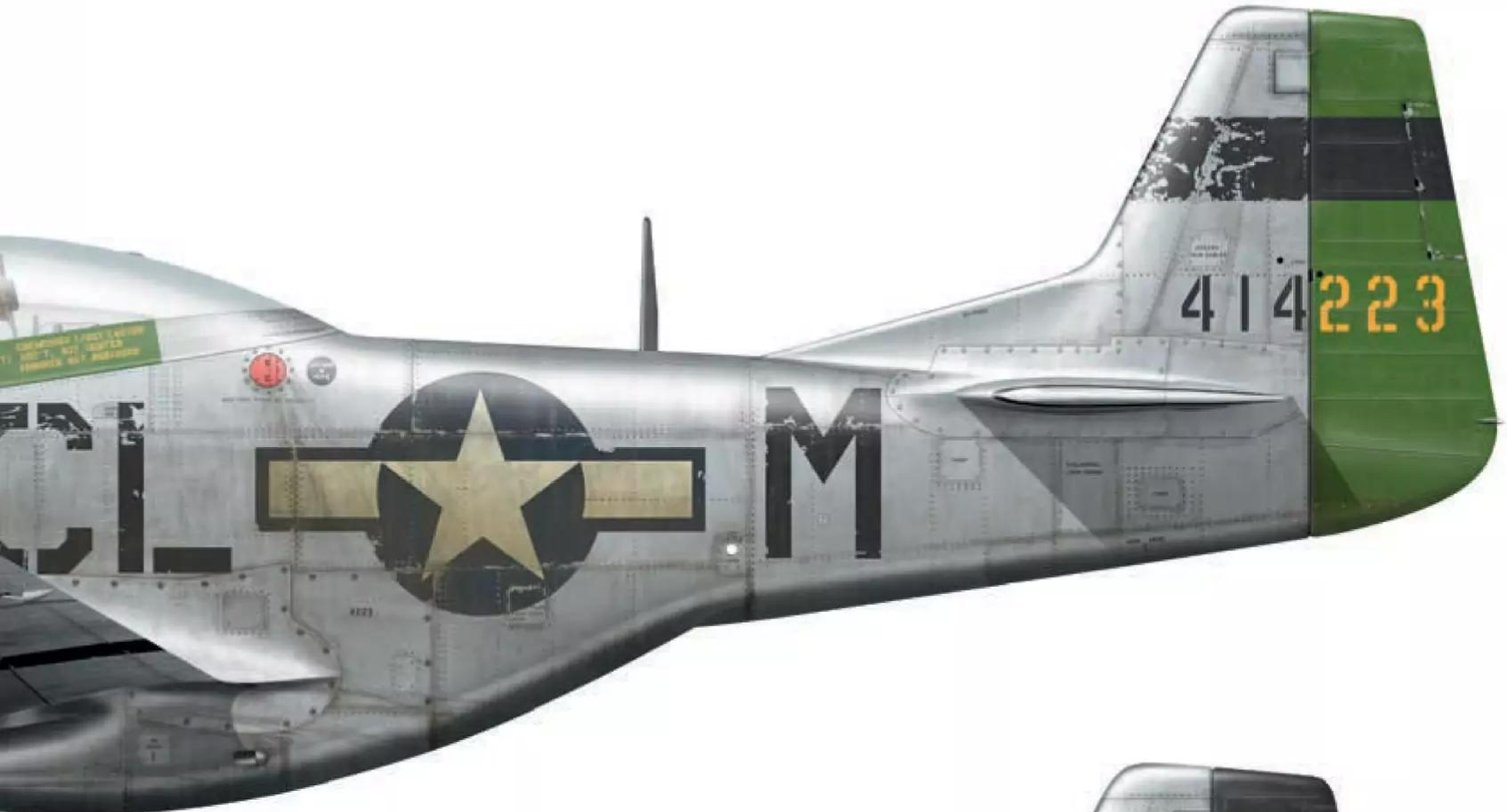
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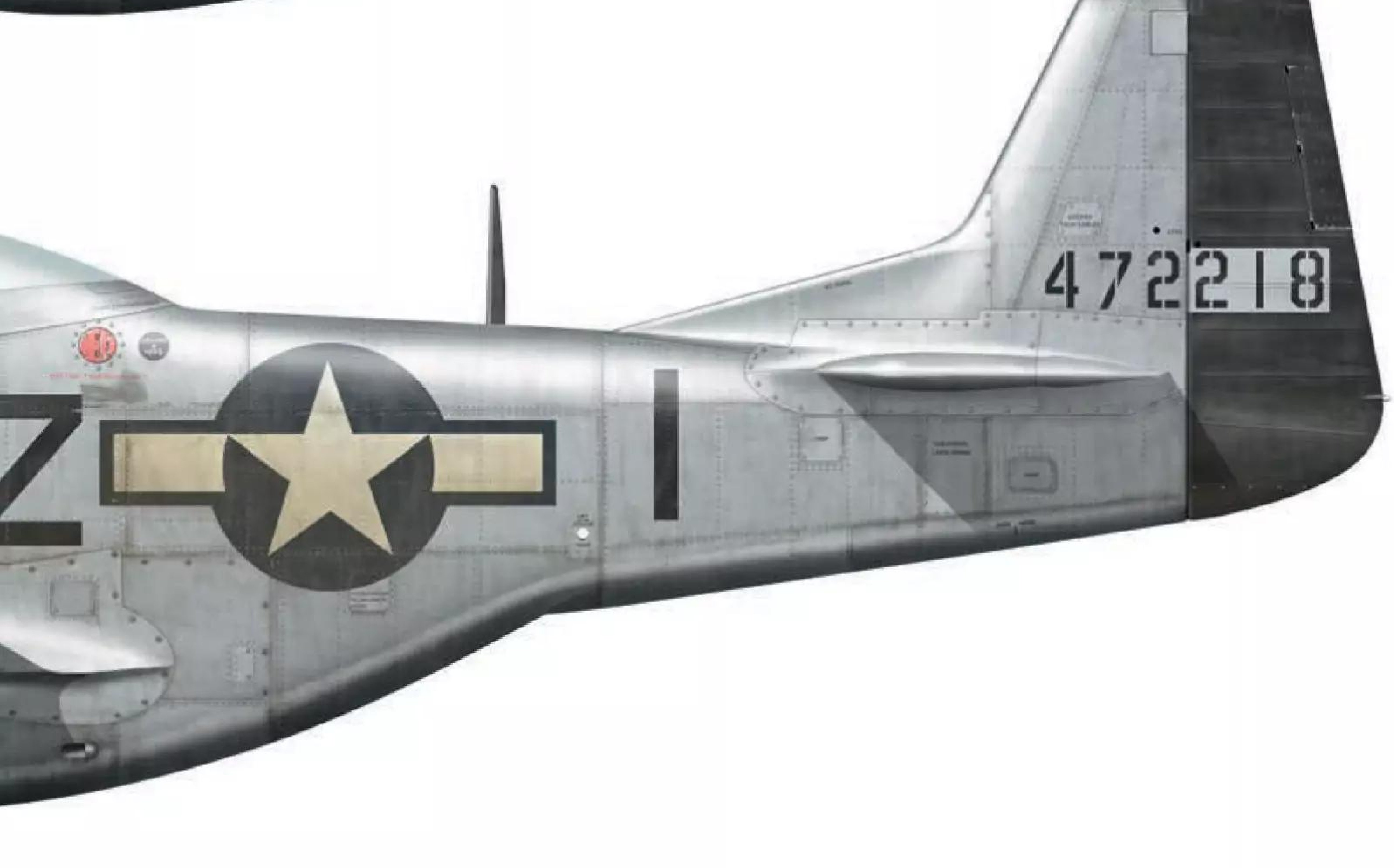
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A 'BUBBLE' CANOPY SIGNIFICANTLY IMPROVED VISIBILITY FOR P-51 PILOTS

Dallas became the P-51C even though they were identical in almost every respect.

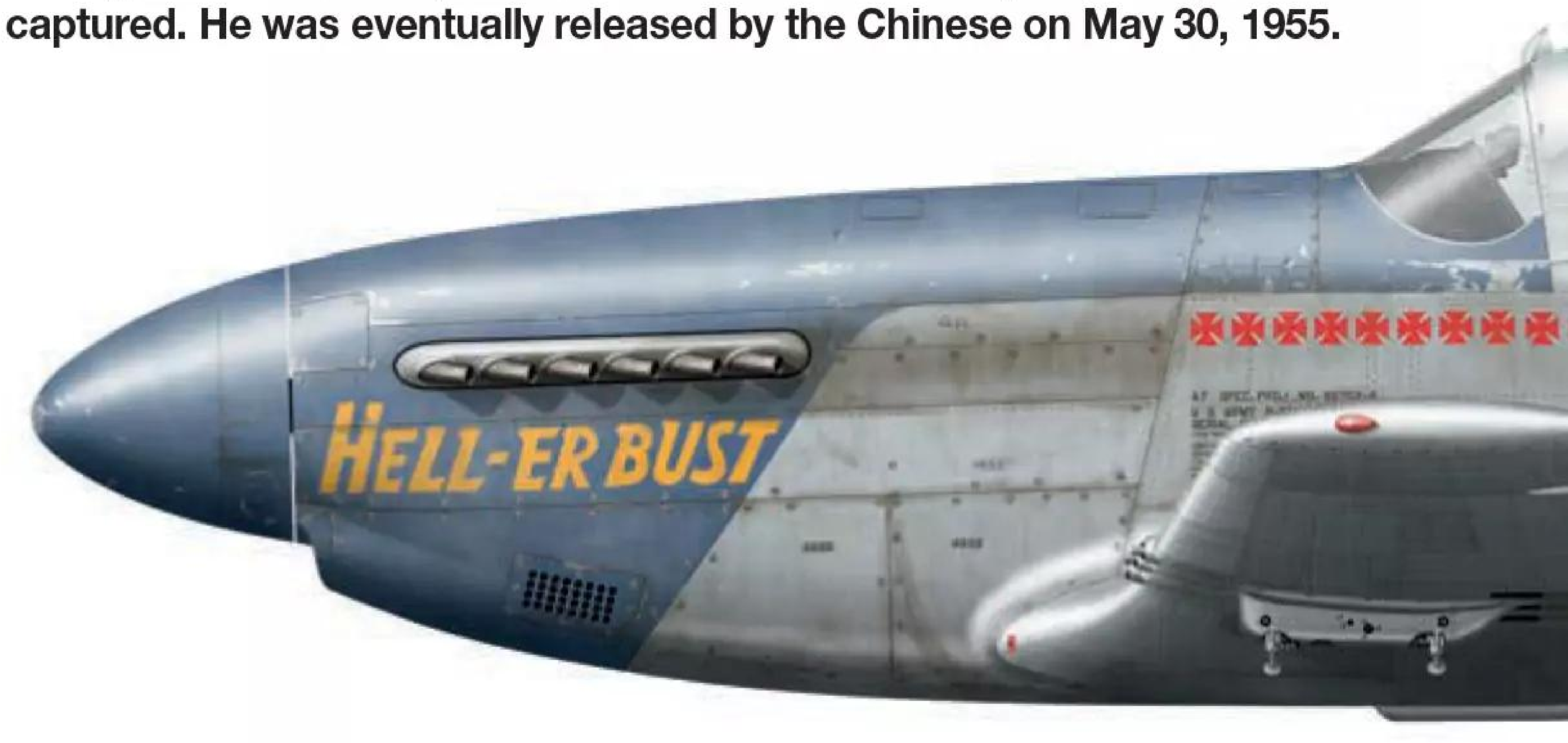
As both factories began gearing up to build the new aircraft, a lend-lease deal was signed with the British for 274 P-51Bs and 626 P-51Cs to see service with the RAF as the Mustang Mk.III.

In fact, in early January 1943, the British government held discussions with North American about a possible successor to the original Mustang. The British felt that the P-51, as delivered, was too heavy and might perform better if its weight was similar to that of a Spitfire. North American took up the challenge and set to work on a lightweight version. The aircraft, designated NA-105, would be a complete redesign with every component and system assessed with an eye to simplification and reducing weight while retaining strength. Two prototypes were ordered as the XP-51F.

Meanwhile, it was clear that despite their outstanding

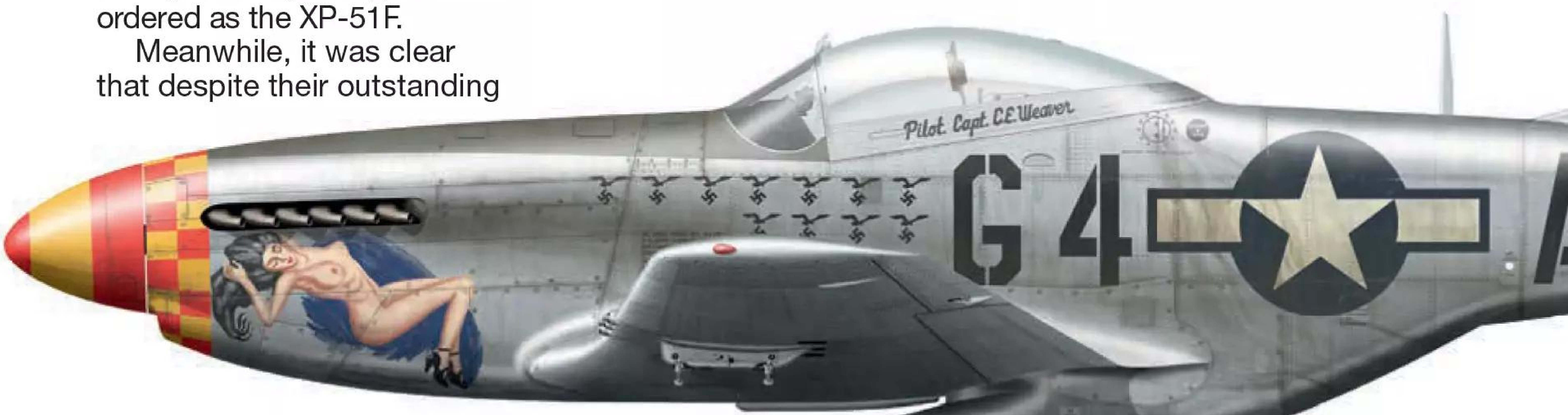
## NORTH AMERICAN P-51D-10 MUSTANG ▼

**Specialising in ground-attack strafling missions, Captain Edwin L Heller of the 486th FS, 352nd FG, flew this aircraft while stationed at Chievres in Belgium during March 1945. His Second World War tally reached 5.5 victories in air combat plus 16.5 on the ground. As a major in the USAF, during the Korean War, he was shot down on January 23, 1953, and captured. He was eventually released by the Chinese on May 30, 1955.**



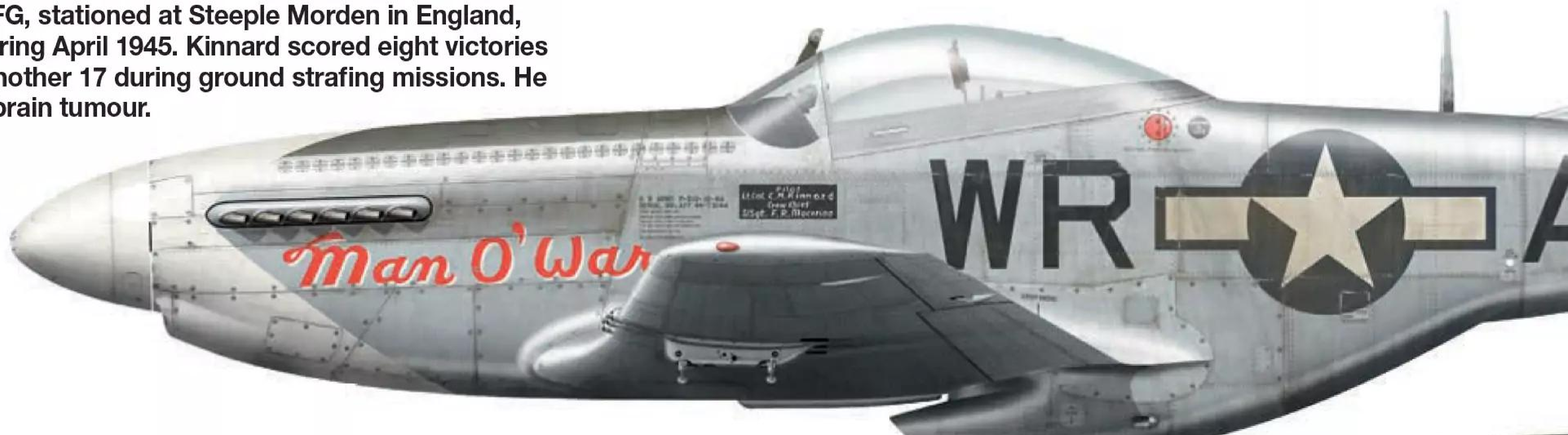
## NORTH AMERICAN P-51D-20 MUSTANG ▼

**Sporting a massive painting of a reclining nude, Captain Charles E Weaver's unnamed P-51D also carries 11 marks to indicate his eight aerial victories and three strafing 'kills'. Weaver served with the 362nd FS, 357th FG, stationed at Leiston in England during April 1945. He survived the war and died in November 2008 aged 85.**



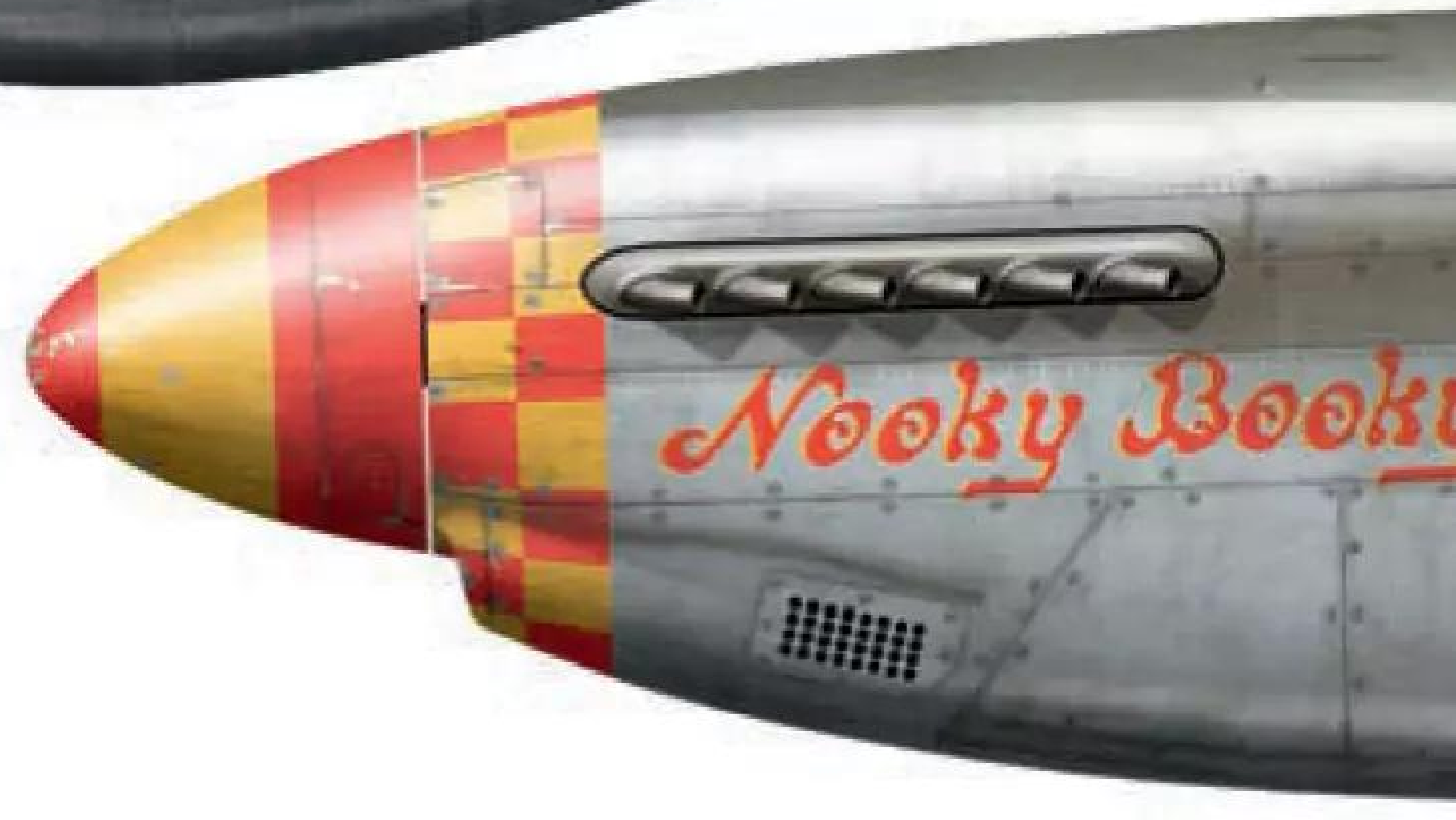
## NORTH AMERICAN P-51D-25 MUSTANG ▼

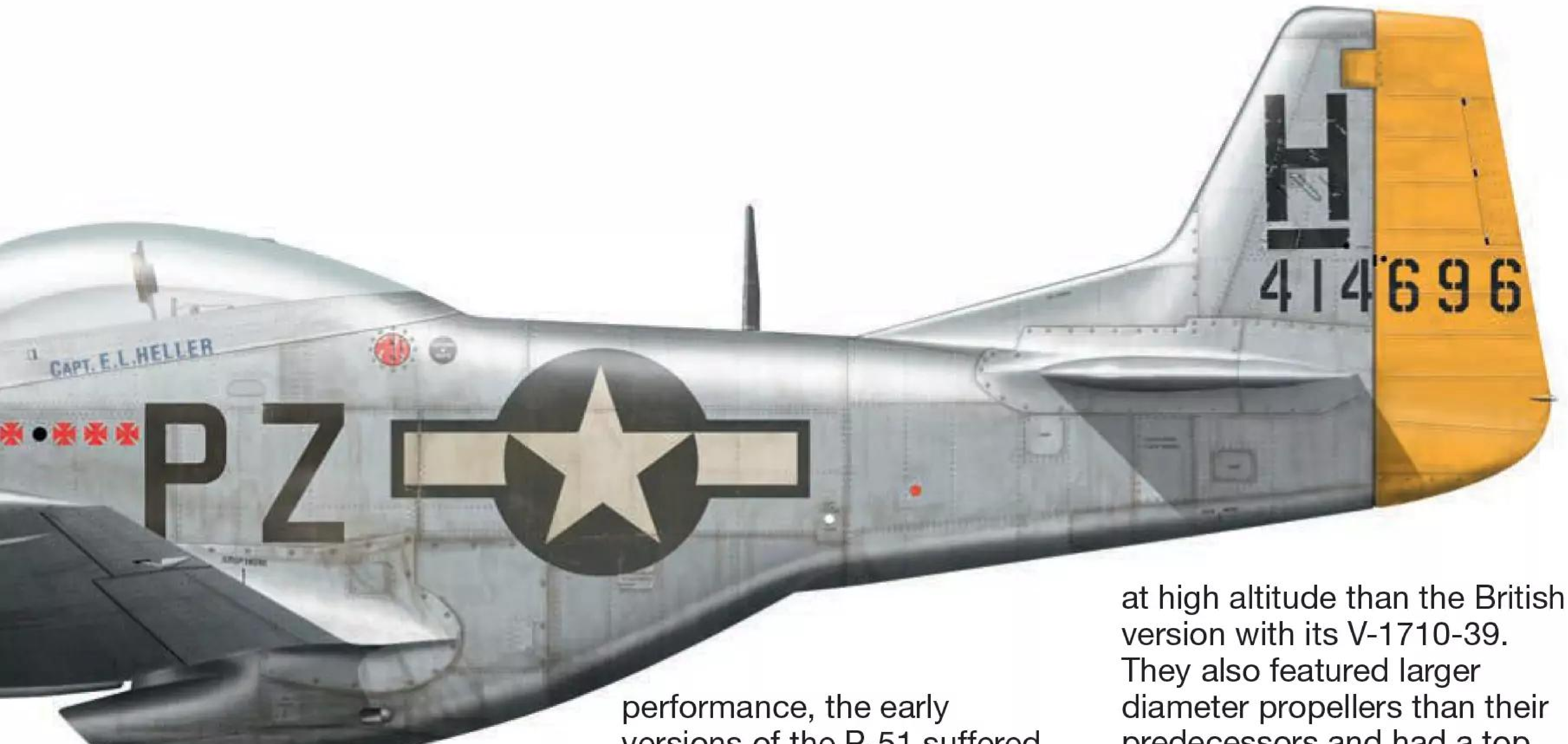
**Lieutenant Colonel Claiborne H 'Zoot' Kinnard Jr., commanding officer of the 355th FG, stationed at Steeple Morden in England, flew 'Man O'War' during April 1945. Kinnard scored eight victories in air combat plus another 17 during ground strafing missions. He died in 1966 from a brain tumour.**



## NORTH AMERICAN P-51D MUSTANG ▶

**Major Leonard 'Kit' Carson of the 352nd Fighter Squadron, 357th FG, stationed at Leiston in England, claimed a Fw 190 shot down on Christmas Eve 1944 while flying 'Nooky Booky IV'. The German fighter is believed to have been flown by Oberleutnant Klaus Bretschneider, Staffelkapitän of 5./JG 300. Carson scored a total of 18.5 victories in air combat.**



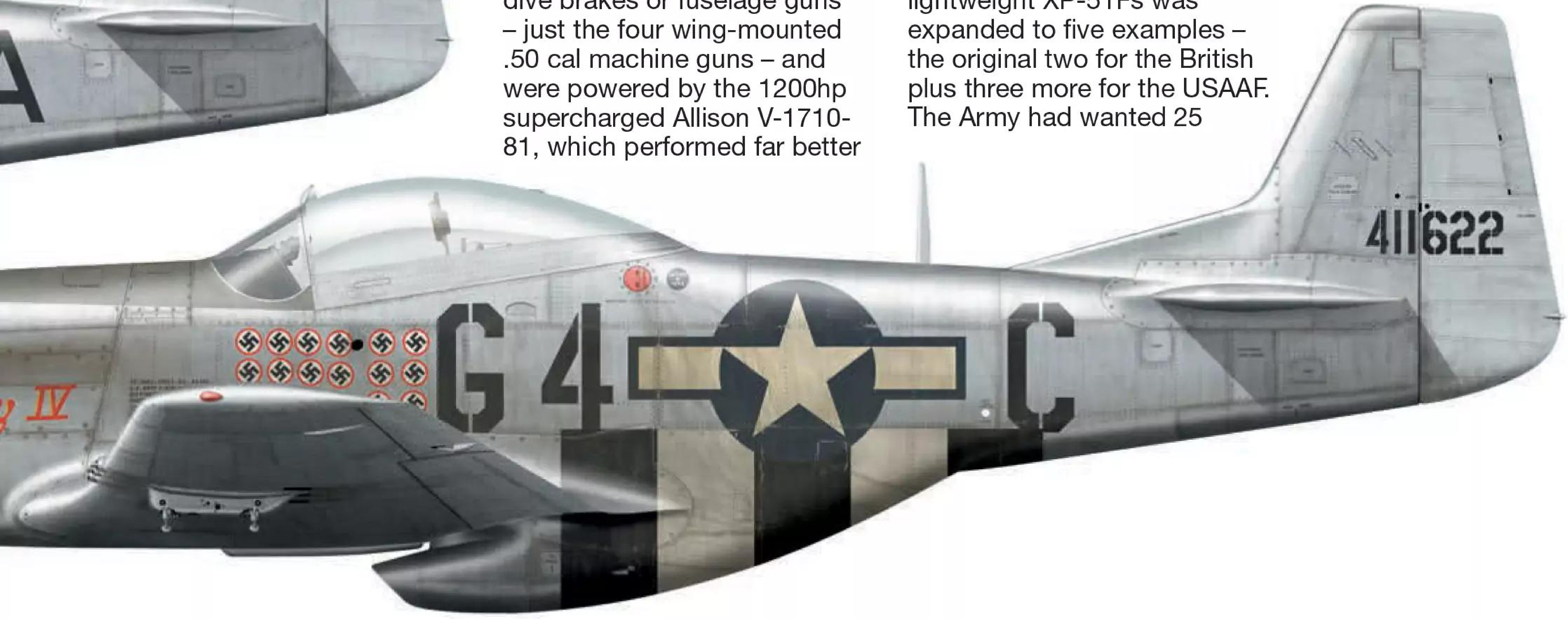


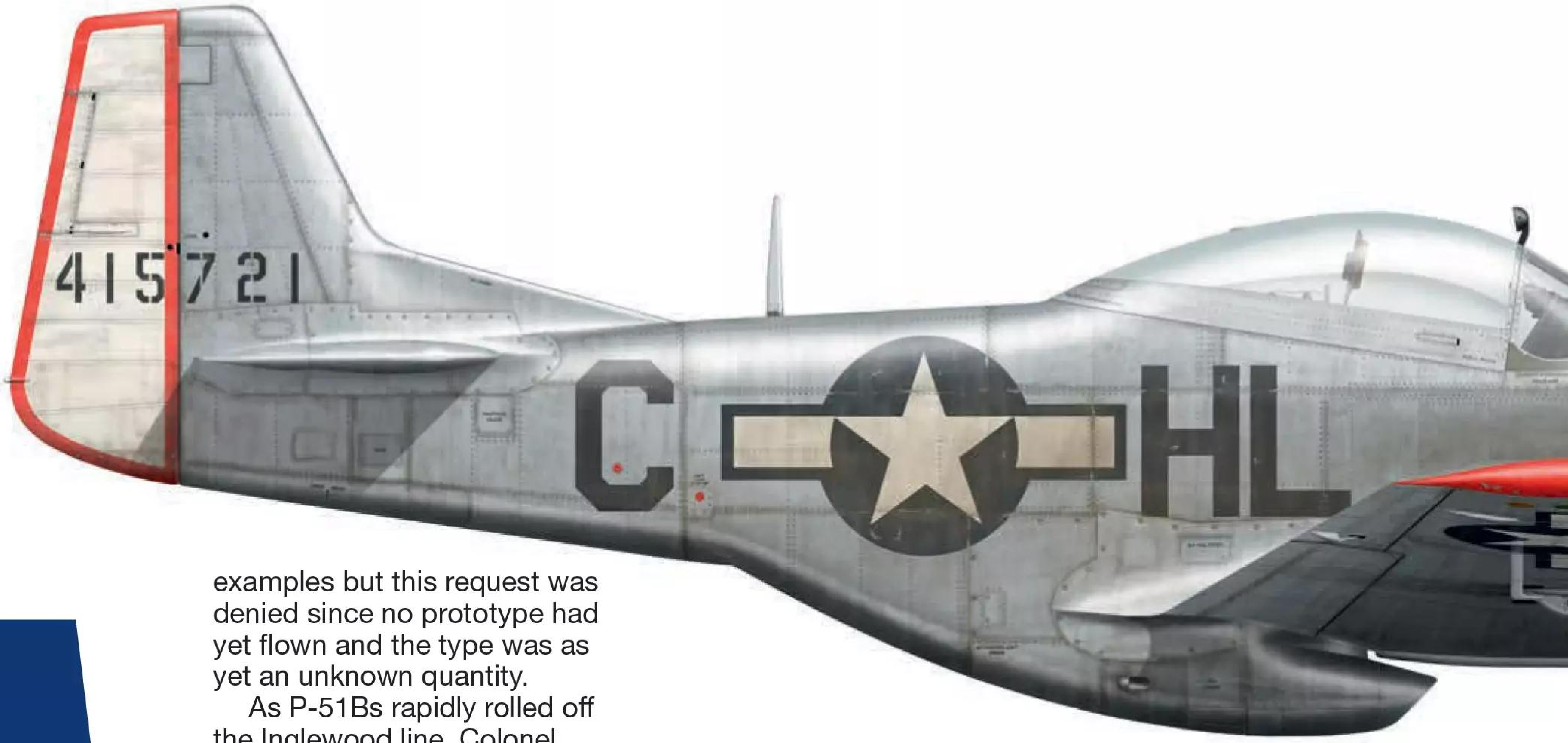
performance, the early versions of the P-51 suffered from poor cockpit visibility. One attempt to resolve this issue involved fitting a 'bulged' canopy Malcolm hood similar to those of Supermarine Spitfires but a better solution was arrived at in January 1943 when Wright Field representative Colonel Mark Bradley saw 'bubble' or 'teardrop' canopies fitted to the Hawker Typhoon and the latest Spitfires. He resolved to take the idea back to American companies and did so later in the year.

The first Allison-engined P-51A made its first flight on February 3, 1943, and deliveries of the 500 A-36As to the 27th and 86th Fighter Bomber Groups in Sicily and Italy were completed in March 1943. At the same time deliveries of the first P-51A got started. These had no dive brakes or fuselage guns – just the four wing-mounted .50 cal machine guns – and were powered by the 1200hp supercharged Allison V-1710-81, which performed far better at high altitude than the British version with its V-1710-39. They also featured larger diameter propellers than their predecessors and had a top speed of 409mph at 11,000ft. Only 310 Allison-engined P-51As were built, however, before production switched to the Merlin-engined P-51B and 50 of them were sent to Britain for service with the RAF as the Mustang Mk.II in late 1942.

During production of the P-51B, a new self-sealing fuel tank was added behind the pilot's seat to offer a further boost to range. However, this tended to alter the aircraft's centre of gravity, which could make it difficult to keep the aircraft pointed in a straight line until the tank was almost empty. In addition, the olive drab livery of the early Mustangs was dropped in favour of a natural metal finish part way through the P-51B/C production runs.

In June 1943, North American's order for lightweight XP-51Fs was expanded to five examples – the original two for the British plus three more for the USAAF. The Army had wanted 25





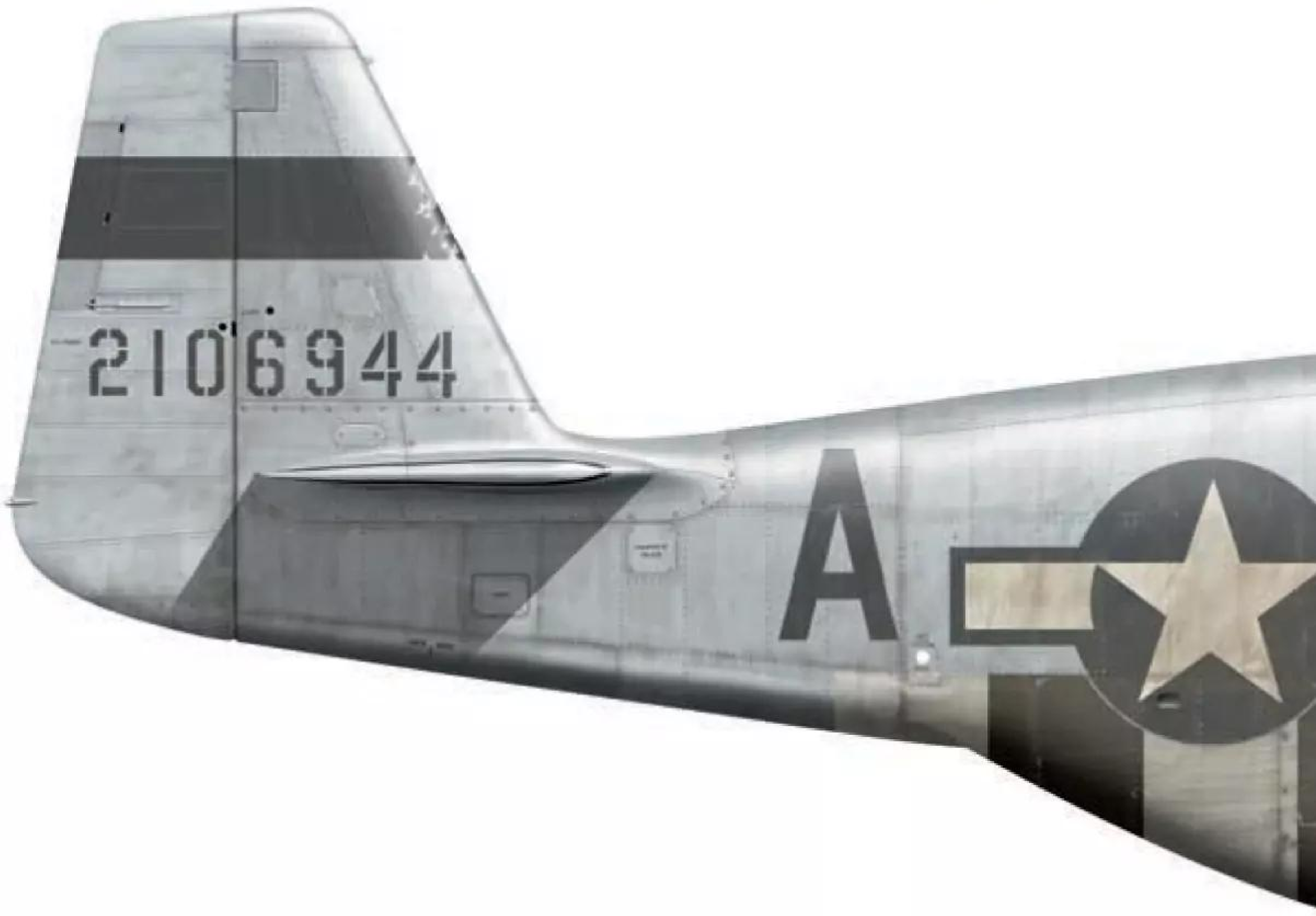
**THE RAF VERSION OF THE P-51D/ P-51K WAS THE MUSTANG MK.IV**

examples but this request was denied since no prototype had yet flown and the type was as yet an unknown quantity.

As P-51Bs rapidly rolled off the Inglewood line, Colonel Mark Bradley was busily persuading the American manufacturers to adopt a bubble canopy for their fighters. Republic quickly came up with a design for the P-47D and North American decided to test a full bubble canopy on a P-51B. This machine, with the upper fuselage behind the cockpit cut away and reshaped to accommodate the new canopy was given the new designation XP-51D. The shape of the canopy was the result of wind tunnel testing to determine the best combination of improved visibility and reduced drag.

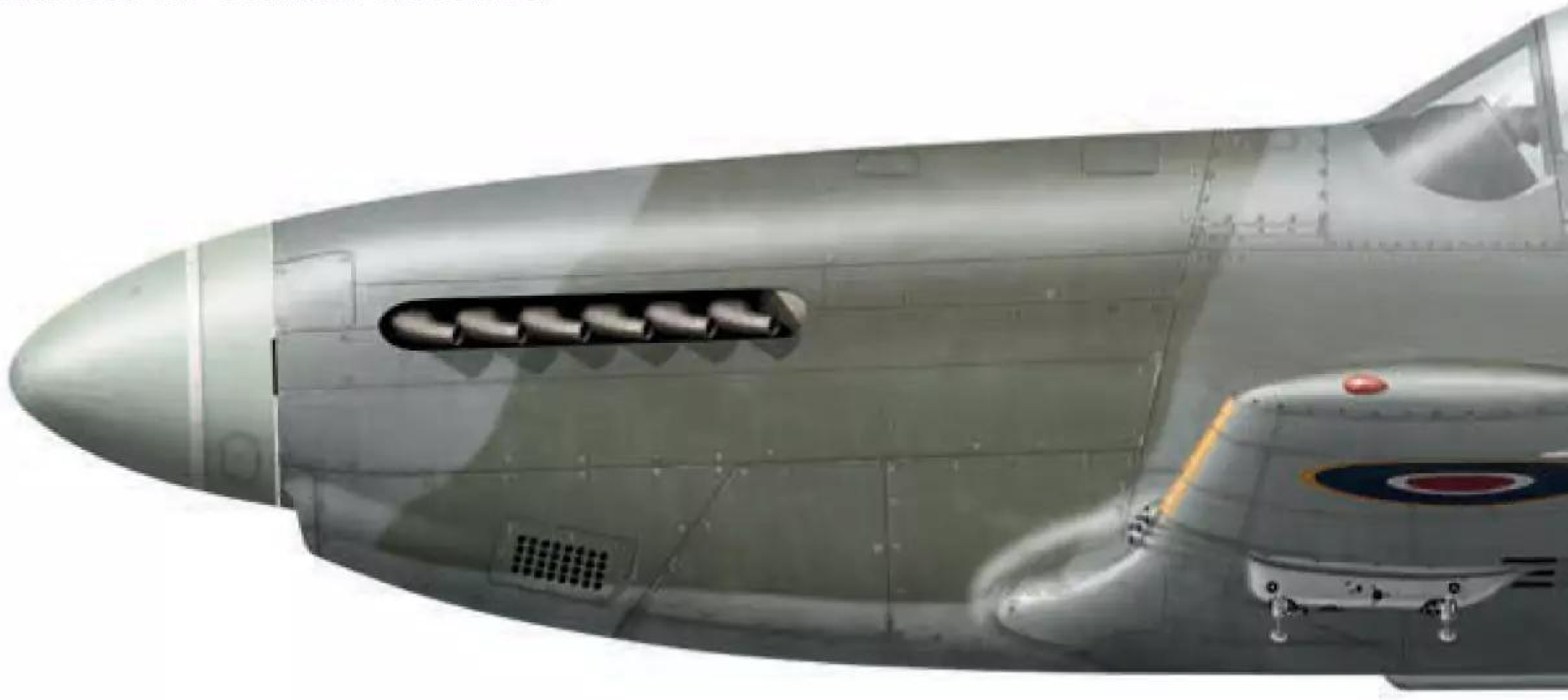
When work on the XP-51D was completed, it made its first flight on November 17, 1943, and the result was exactly as hoped – the pilot Bob Chilton reported that the canopy did indeed dramatically improve visibility without any drawbacks to speak of. With the concept proven, North American pulled two P-51Bs from the Inglewood production line and had them finished as NA-106s, with the remodelled rear fuselage and bubble canopy. These were the first P-51Ds. While the Inglewood plant built the 'D', the same machine but for a few small detail differences was built as the P-51K at the Dallas plant.

The 'D' also received heavier armament, with three .50 cal machine guns in each wing



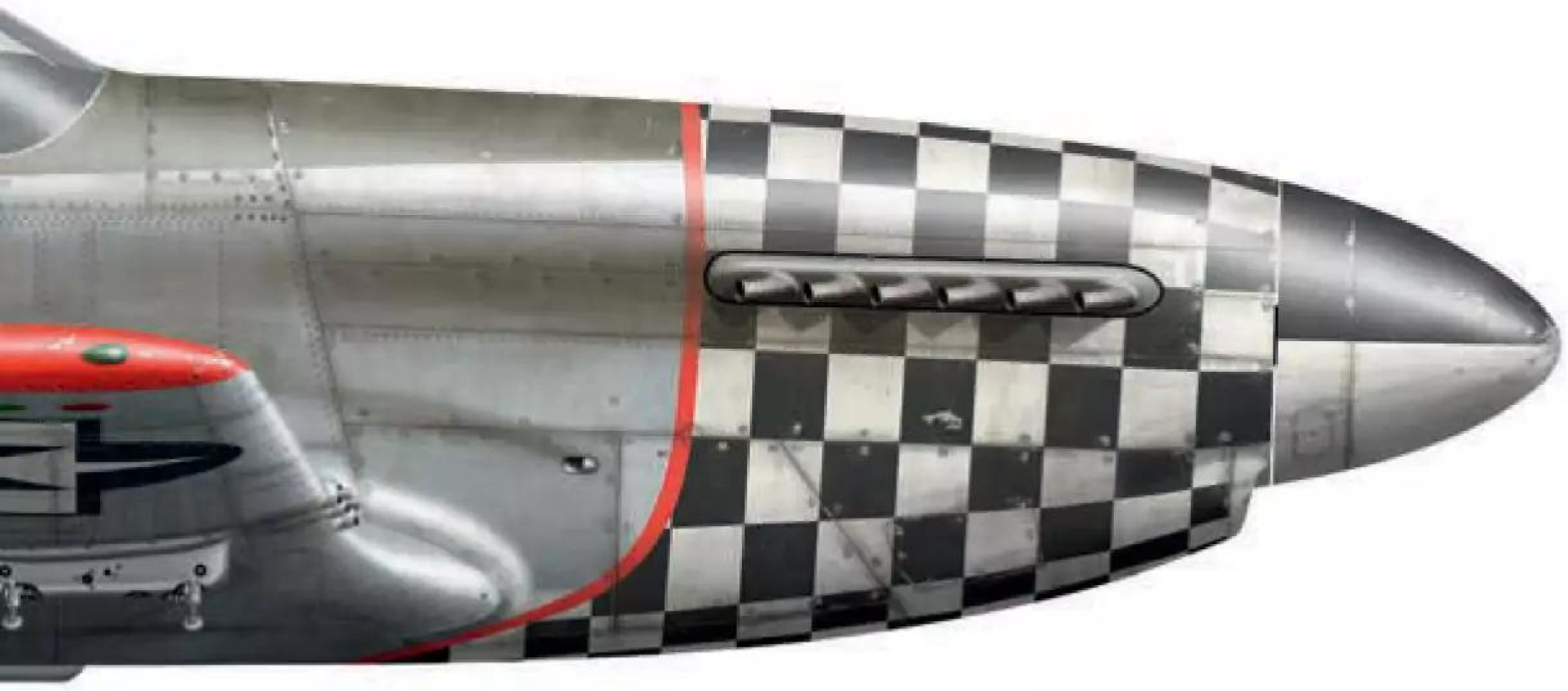
**NORTH AMERICAN P-51K MUSTANG MK.IVA ▼**

**Top scoring RAF Mustang Mk.IV pilot Flight Lieutenant Graham Pearson, of 65 Squadron, based at Peterhead in Scotland, was flying this aircraft on April 19, 1945, when he suffered engine failure and had to make a forced landing at Getteron, on the west coast of Sweden. He was interned for a short time before being returned to the UK. When the war ended he had four air combat victories.**



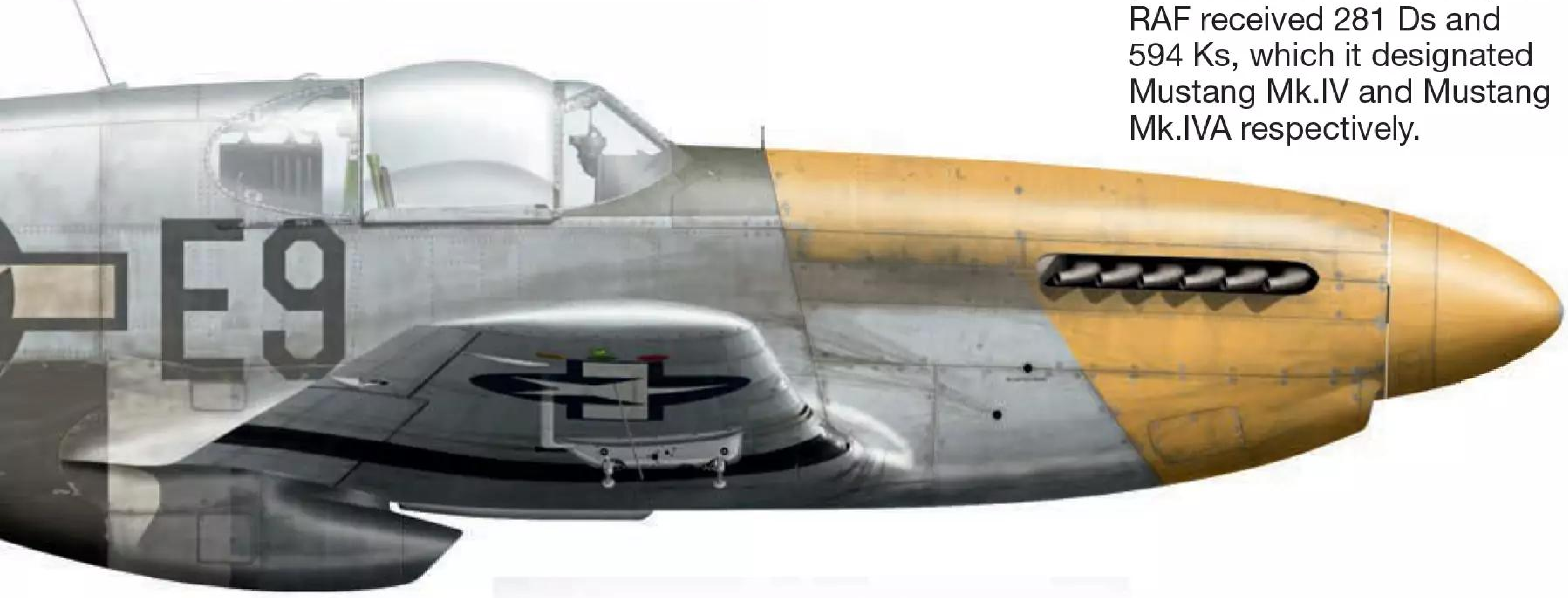
## NORTH AMERICAN P-51D MUSTANG ▼

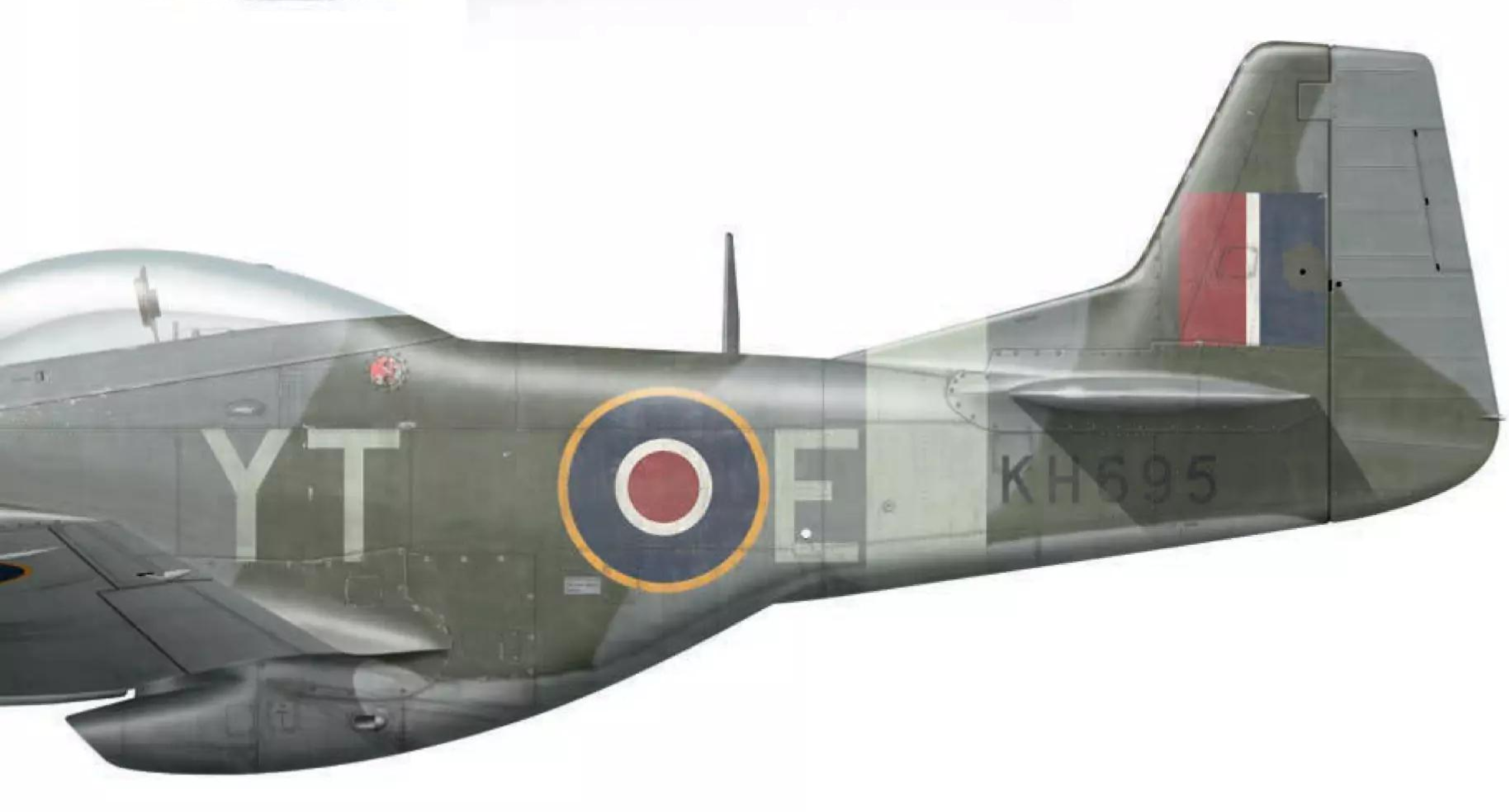
**On Sunday, March 19, 1945, 1st Lieutenant Elmer K Nieland of the 83rd FS, 78th FG, stationed at Duxford in Cambridgeshire, England, was flying as part of a group of 47 Mustangs tasked with attacking airfields around Osnabrück. They initially had some success in attacking Bf 109s of IV/JG 27 and Fw 190 D-9s of II/JG 26 before Fw 190 D-9s from IV/JG 26, returning from a patrol, saw what was happening and caught the Americans unawares. Nieland's was among a number of P-51s shot down but he managed to bail out and survived, albeit with burns to his neck.**



## NORTH AMERICAN P-51B MUSTANG ▼

**Flying this P-51B on September 17, 1944, near Geldern, Germany, Texan 1st Lieutenant Woodrow W Glover of the 376th FS, 361st FG, stationed at Bottisham, England, was shot down and killed by a Bf 109.**





instead of two. The guns of the P-51B had been mounted at an angle within the wing due to the lack of space, which caused ammunition feed problems, but the P-51D's guns were all mounted upright – eliminating the issue. There was an increase in the P-51D's wing-root chord too, the landing gear was strengthened and a dorsal fin was added ahead of the rudder part-way into the production run to provide better directional stability.

The P-51D was the first variant to be fitted with the K-14 gyro gunsight, which dramatically increased P-51 pilots' chances of making a 'kill'. Later examples of the P-51D also had underwing hard points so they could carry bombs, drop tanks and a variety of different rocket launchers.

In addition to a large number of Ds and Ks being produced for the USAAF, the RAF received 281 Ds and 594 Ks, which it designated Mustang Mk.IV and Mustang Mk.IVA respectively.

**THE P-51S AND P-51F TESTED DESIGN FEATURES FOR THE P-51H**

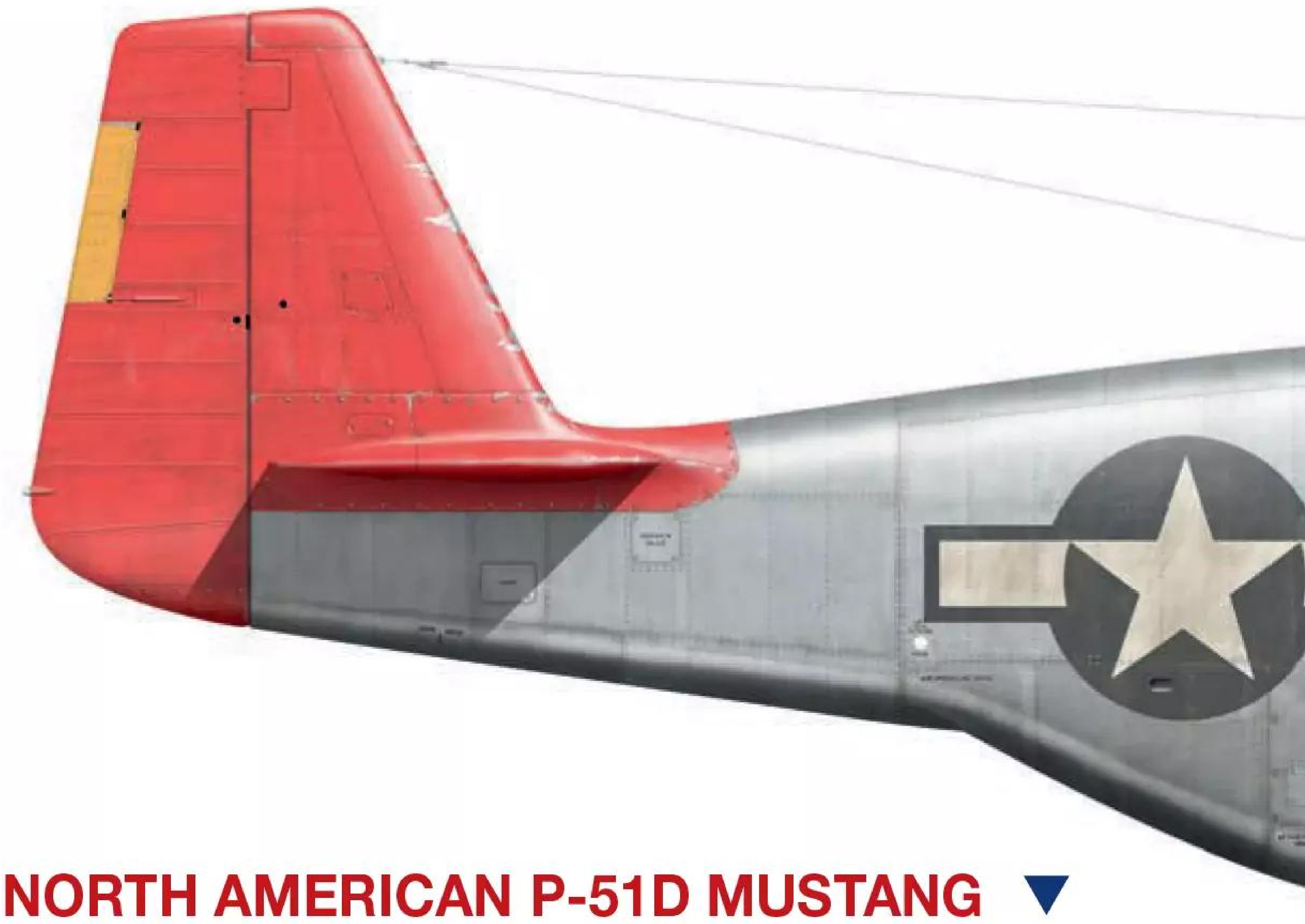
In January 1944, it was decided that while three of the lightweight XP-51Fs should be built as planned, the remaining two would be fitted with Rolls-Royce Merlin 145M engines from England as the XP-51G.

The following month, the first XP-51F was completed and test flown. It did indeed represent a complete redesign and shared almost no parts in common with earlier Mustangs: the landing gear main legs were lightened, the wheels were made smaller, the wings were slightly larger with a straight leading edge and the inboard guns were deleted. The wing tanks were made smaller and the fuselage tank was also deleted but the cockpit canopy was substantially enlarged. The mounting for the engine, the radiators and the hydraulic system were all simplified to save weight and the oil cooler was removed from the rear fuselage radiator group – eliminating long oil lines and saving even more weight.

In the cockpit, a standard British layout was adopted and the pilot's seat was made from armour, rather than being made then having armour added to it. Improvements were made to the aerodynamic control surfaces and the tail fin was enlarged. Many parts were made from moulded plastic rather than metal and finally, a three-bladed hollow steel propeller saved even more weight.

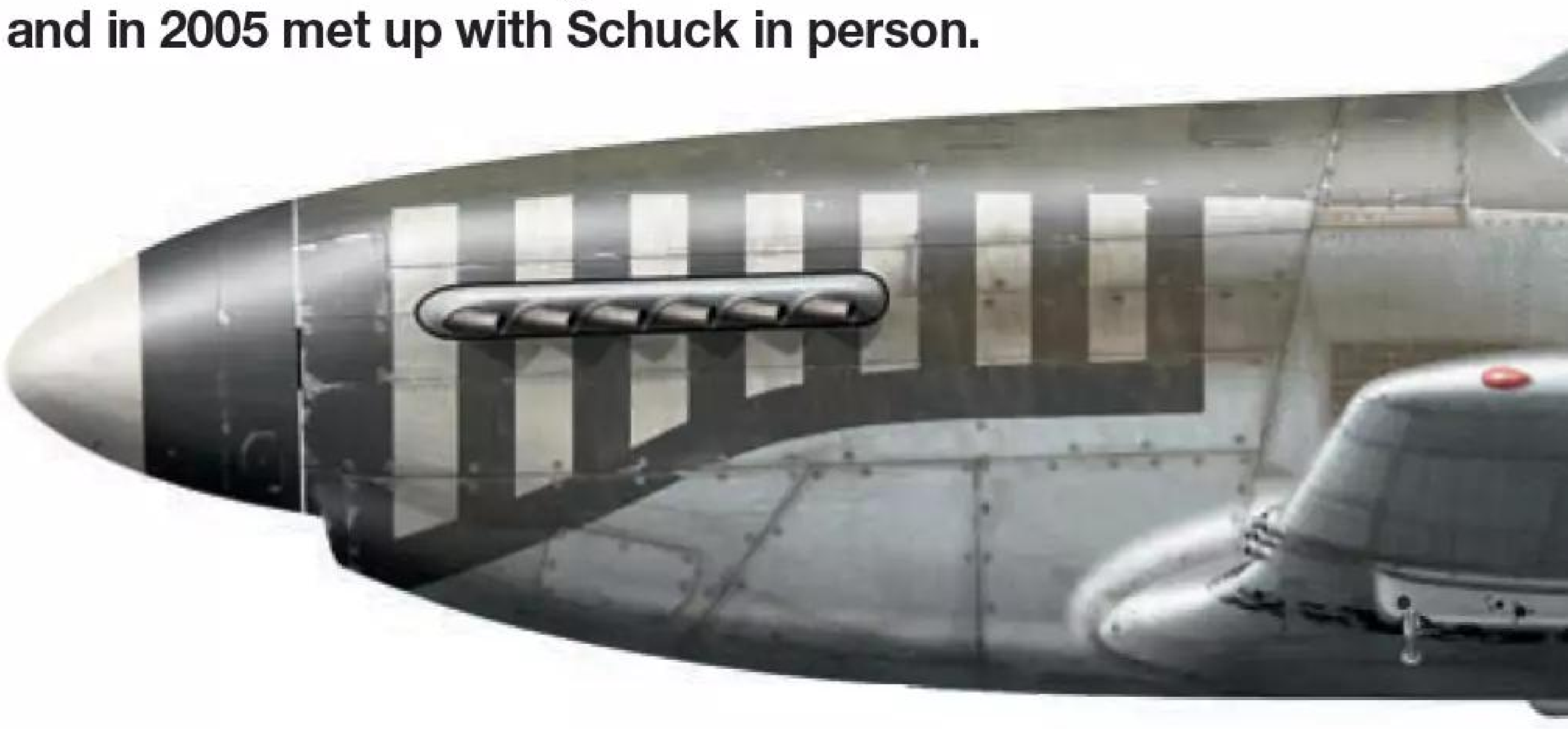
It had the same engine as the P-51D, the 1695hp Packard Merlin V-1650-7, but it managed to achieve a top speed of 466mph at 29,000ft. The second and third XP-51Fs were finished on May 20 and 22.

The first XP-51G, which apart from its engine only differed from the XP-51Fs in



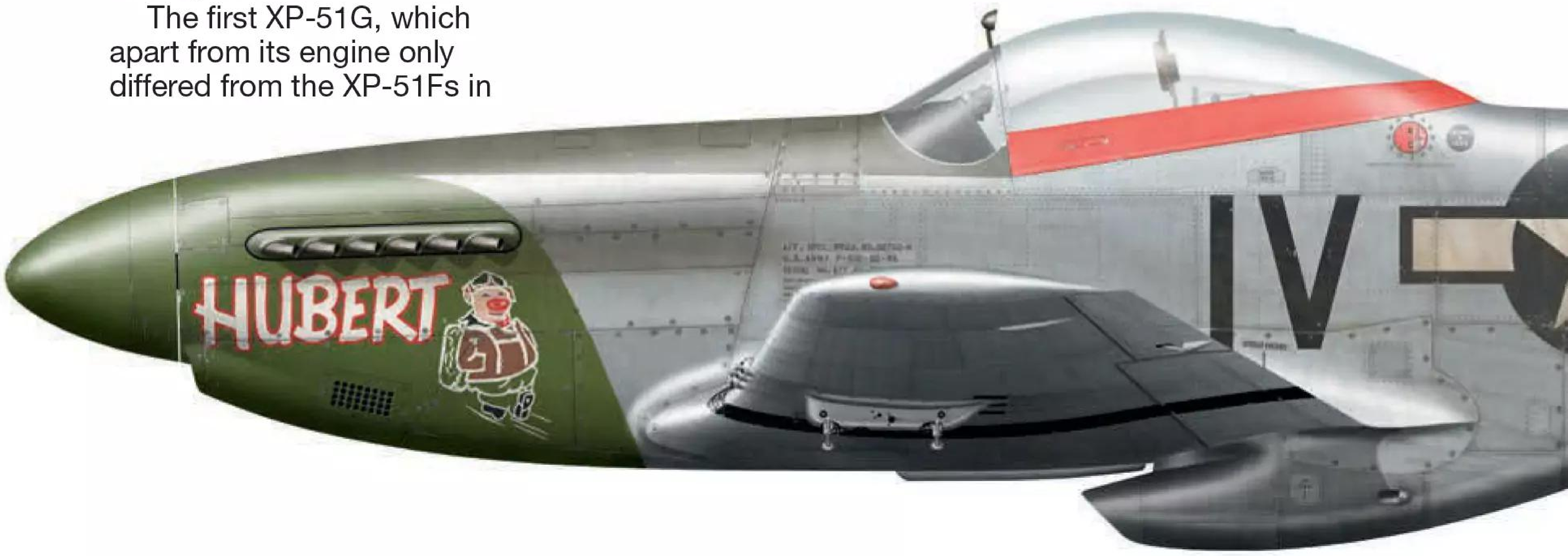
## NORTH AMERICAN P-51D MUSTANG ▼

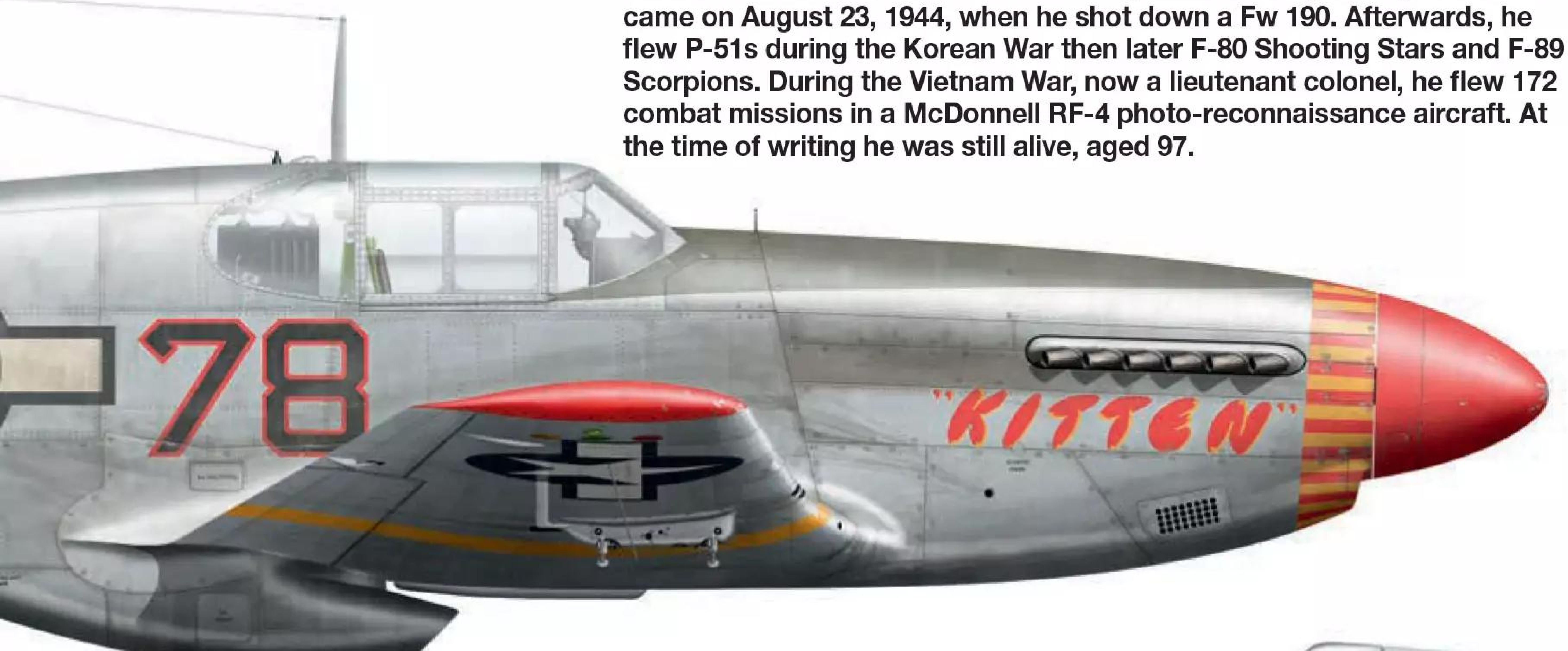
**During his 49th and last combat mission on April 10, 1945, Lieutenant Joseph A Peterburs of the 55th FS, 20th FG, based at Kingscliff, England, shot down a Me 262 piloted by Oberleutnant Walter Schuck. Later that same day, Peterburs himself was shot down by flak while strafing an airfield. He was captured but managed to escape and ended up fighting with a Russian tank unit during the Battle of Wittenberg on the Elbe. He later fought in both the Korean and Vietnam wars and in 2005 met up with Schuck in person.**



## NORTH AMERICAN P-51D MUSTANG ▼

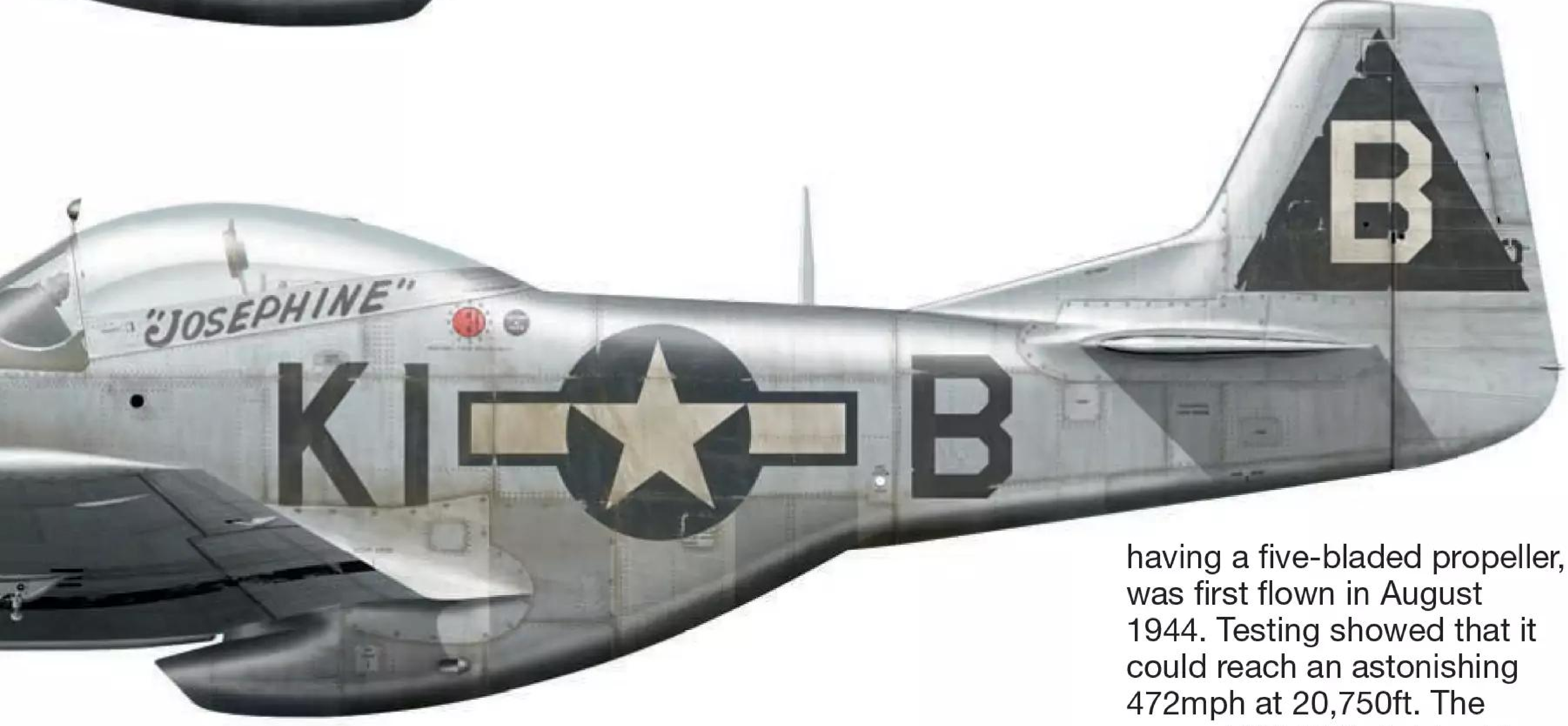
**This aircraft with its cheerful 'Hubert' pig logo was flown by Captain Rene L Burtner of the 369th FS, 359th FG, stationed at East Wretham in England. Burtner continued to fly with the 359th Fighter Group until his tour ended in September 1945.**

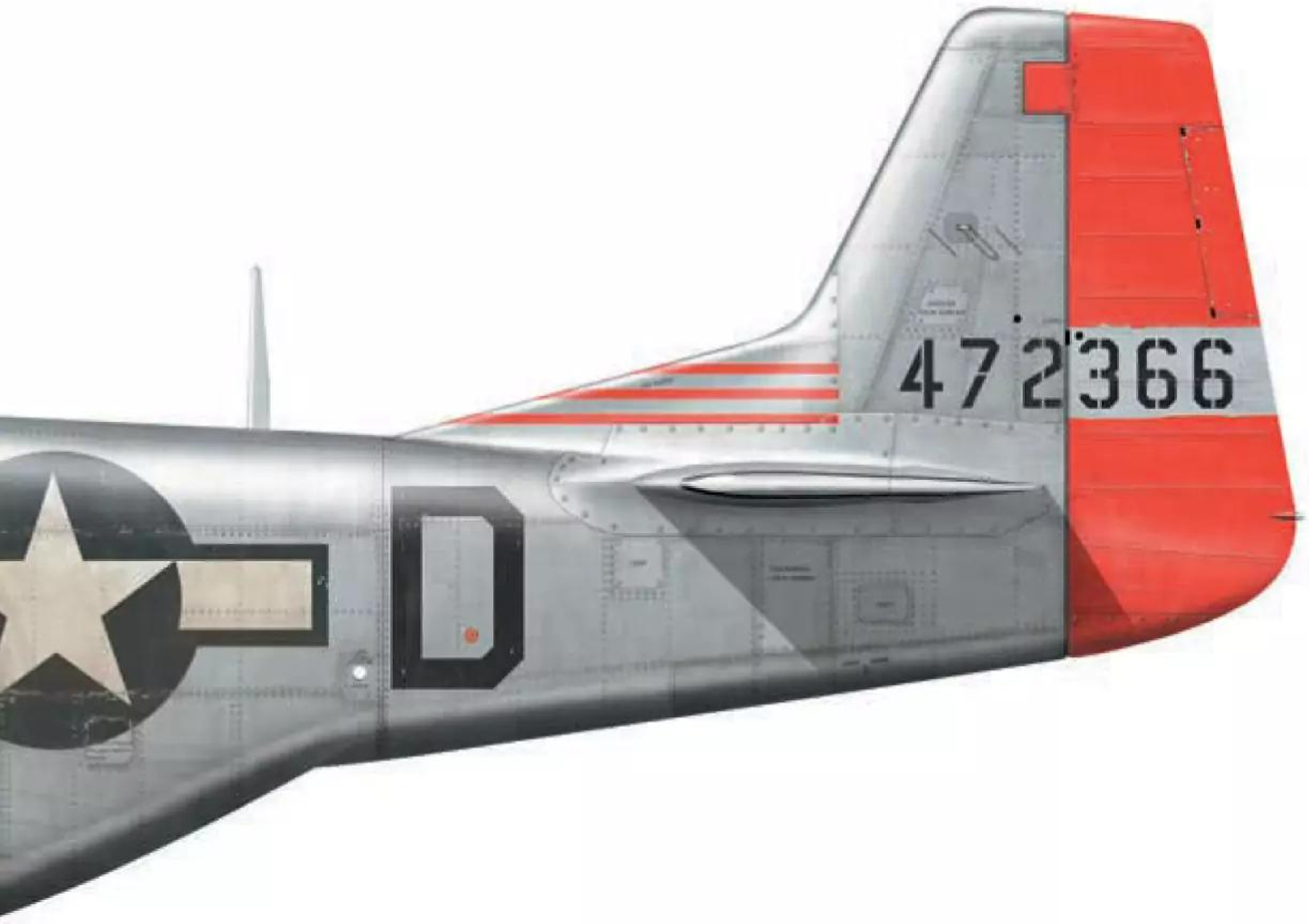




## NORTH AMERICAN P-51C MUSTANG ▼

**Tuskegee airman Lieutenant Charles McGee, of the 302nd FS, 332nd FG, flew the red-tailed 'Kitten' on October 4, 1944. His only victory of the war came on August 23, 1944, when he shot down a Fw 190. Afterwards, he flew P-51s during the Korean War then later F-80 Shooting Stars and F-89 Scorpions. During the Vietnam War, now a lieutenant colonel, he flew 172 combat missions in a McDonnell RF-4 photo-reconnaissance aircraft. At the time of writing he was still alive, aged 97.**





having a five-bladed propeller, was first flown in August 1944. Testing showed that it could reach an astonishing 472mph at 20,750ft. The second XP-51G, finished in November 1944, was sent to Britain where it managed to hit 495mph during tests at Boscombe Down.

Neither the XP-51F or XP-51G entered full production though two more prototypes were later ordered as the XP-51J, which did not enter production either. This had an Allison V-1710-119 engine with a two-stage gear-driven supercharger and was expected to achieve 491mph in level flight. The war ended and development halted before it got the chance.

The P-51H was the final wartime production version of the Mustang and had the North American company designation NA-126. Many of its features were taken directly from the XP-51F/G programme, although its engine was an uprated Packard Merlin V-1659-9 rather than a V-1650-7 or a Merlin 145M.

The V-1659-9 featured a Simmons automatic boost control for maintaining constant manifold pressure and was also equipped with a water injection system which allowed the pilot to briefly overboost the engine up to a war-emergency power of more than 2000hp.

Compared to the P-51D, the H had a taller fin and rudder. The fuselage's overall length was increased too, up to 33ft 4in against the D's 32ft 3in. It had a shallower carburettor air intake under its nose, a modified engine cowl that included and integral engine mount and a simpler undercarriage with disc brakes and smaller wheels, like those of the P-51F. The radiator was deepened and the forward edge of the inlet duct was vertical.

The huge canopy of the two experimental designs was not carried over, however, with the P-51H featuring a hood that was closer in its dimensions to that of the P-51, but with the 'hump' further forwards, directly over the pilot's head. In fact, the pilot's position was raised slightly to provide a better view through the gunsight. The fuselage fuel tank was still fitted behind the pilot but its capacity was reduced to 50 gallons.

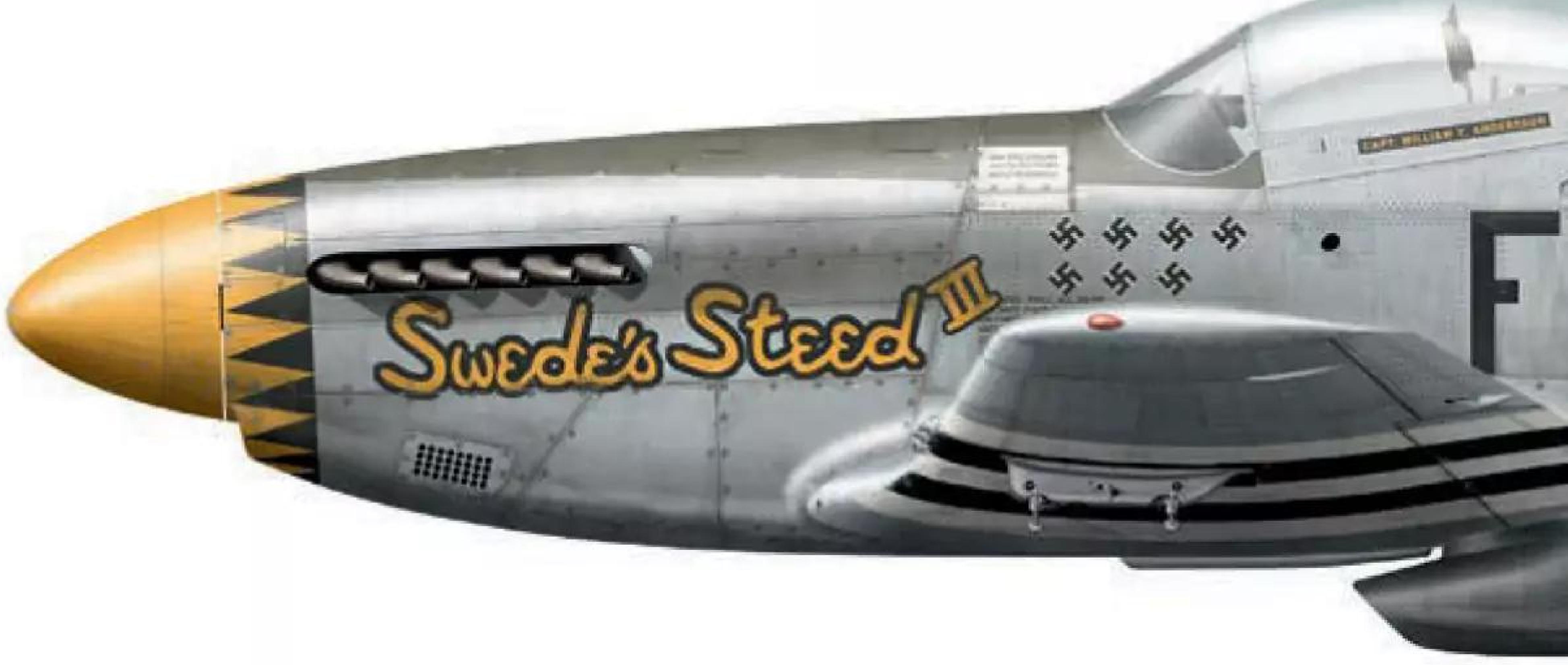
Six machine guns were fitted, although there was also an option to fit only four, and the usual underwing hard points featured on the P-51D were included. However, the wing doors were redesigned to provide easier access to the guns and ammunition feed system to make reloading and maintenance easier.

Production lines for the P-51H were being established as early as June 1944 but the first full production example was not flown until February 3, 1945. The USAAF placed orders for a total of 2000 P-51Hs, since alongside the P-47N it was to be used during the projected invasion of the Japanese home islands. All of these were to be built at Inglewood, while a further

**INTENDED FOR USE DURING THE INVASION OF THE JAPANESE HOME ISLANDS, THE P-51H ARRIVED TOO LATE**

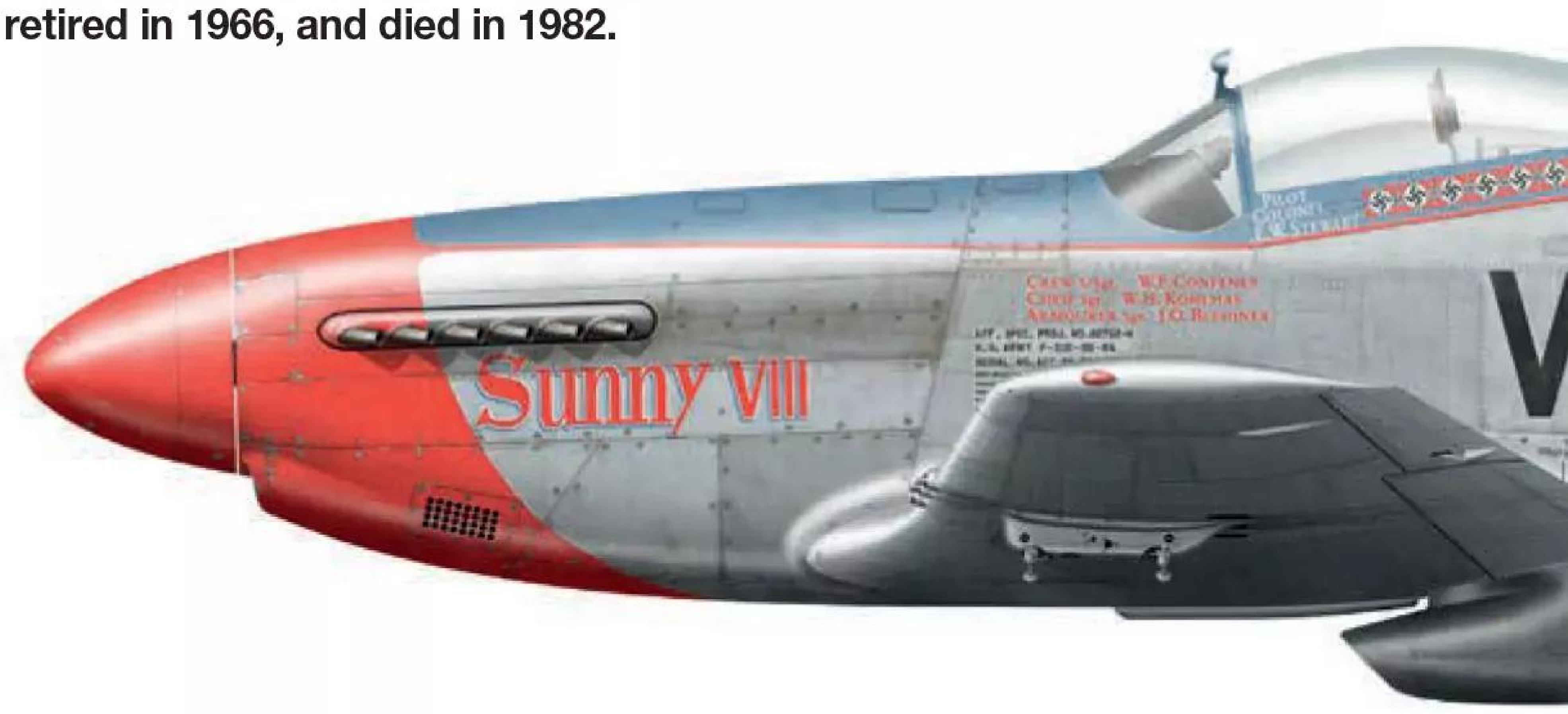
## NORTH AMERICAN P-51D MUSTANG ▼

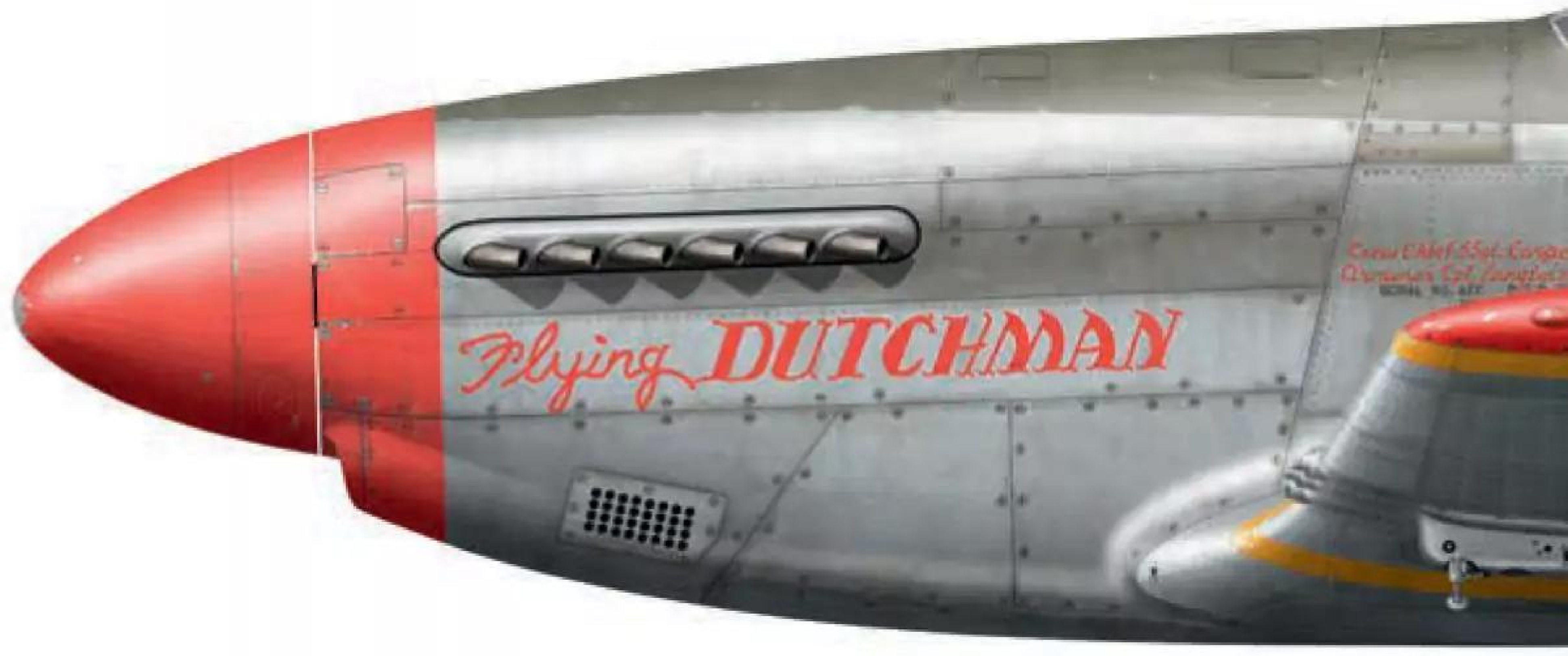
**Swedish American Captain William Y Anderson of the 353rd FS, 354th FG, flew this aircraft while based at Orconte in France during the autumn of 1944 after he had achieved the last two of his seven aerial victories – a pair of Bf 109s on August 7, 1944. Anderson survived the war and died in May 2011 aged 89.**

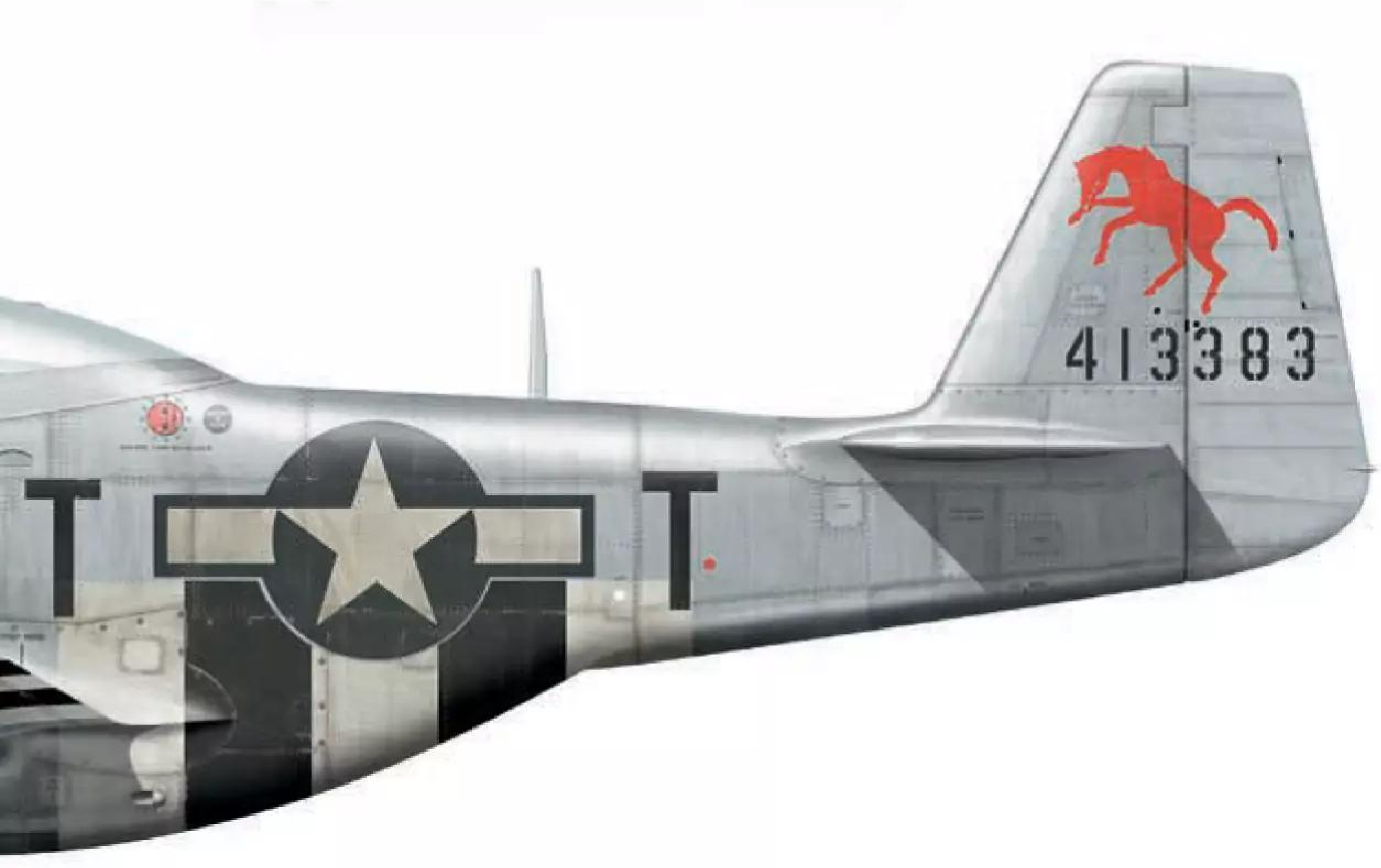


## NORTH AMERICAN P-51D MUSTANG ▼

**The first mission flown by Colonel Everett E W Stewart, commanding officer of 4th FG, had been at Pearl Harbor on December 7, 1941, when the Japanese attacked. He then went on to fly P-40s from Wake and Midway Islands from February to September 1942. Transferred to Europe in December 1943, he was first made CO of the 355th FG then took charge of the 4th from February 1945. His personal aircraft, 'Sunny VIII' is shown as it appeared in April 1945. Stewart was apparently softly spoken and always did his best to get along with others – making him a firm favourite with his men. He remained with the air force after the war, retired in 1966, and died in 1982.**







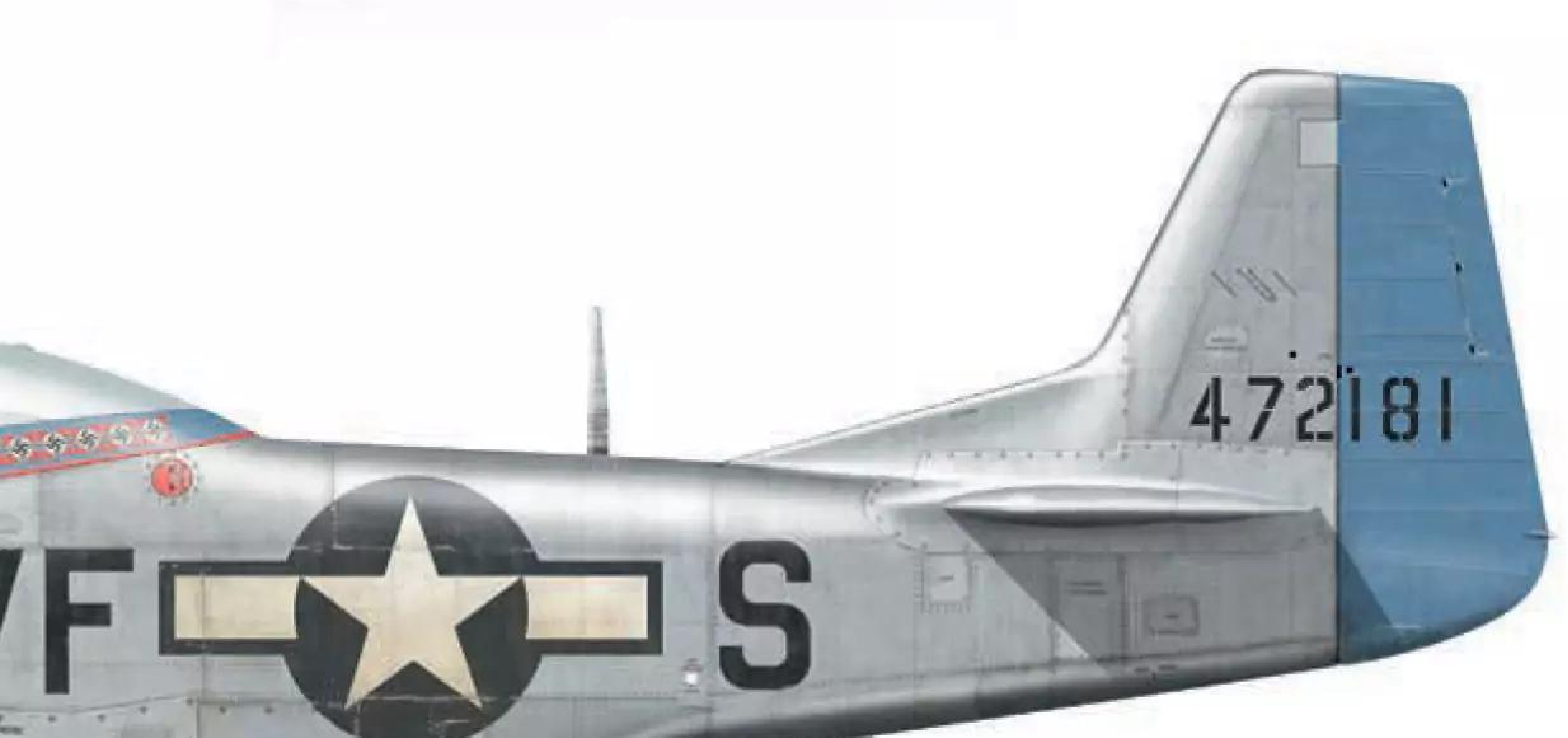
1629 were to be built at Dallas under the designation P-51M. The latter differed a little more than earlier Dallas version in having the V-1650-9A engine, which was less powerful since it lacked water injection.

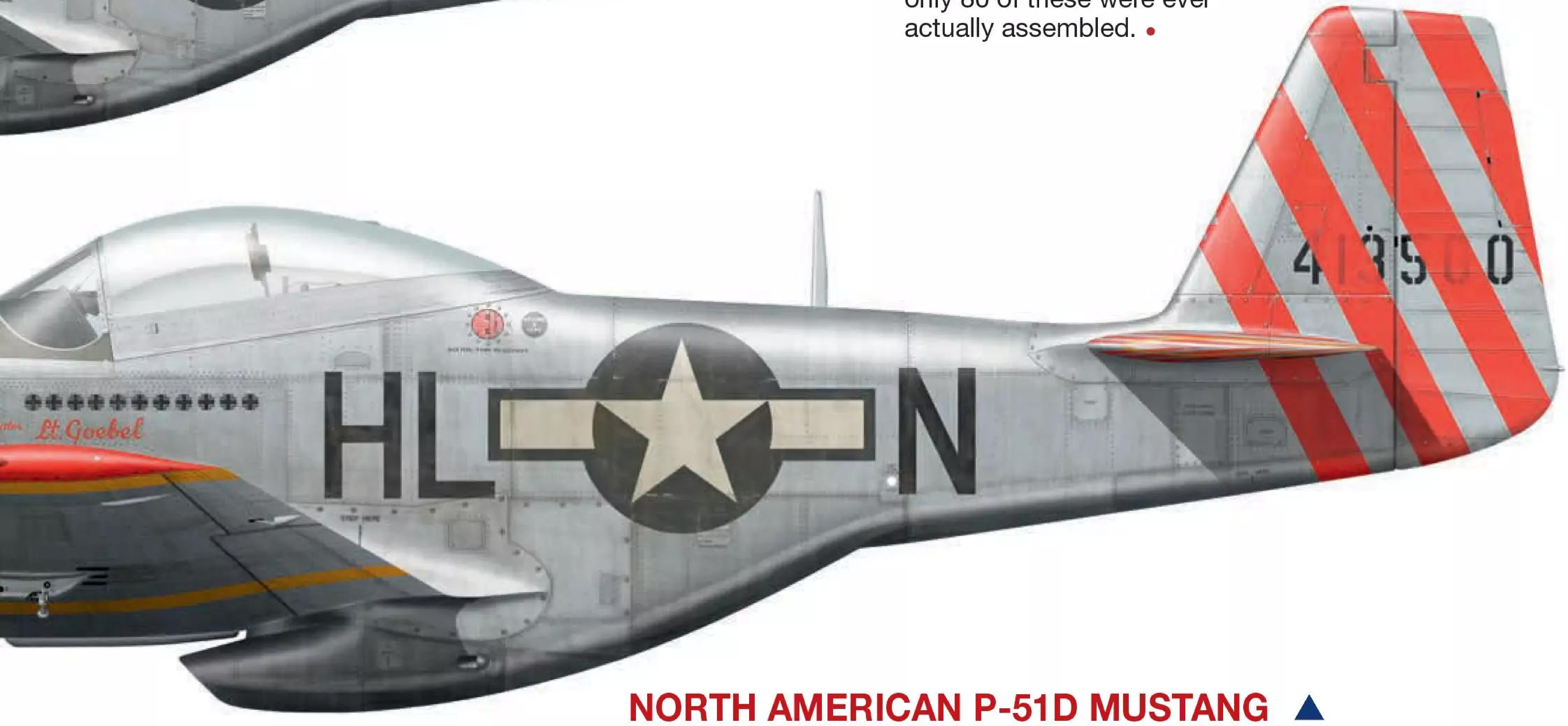
There was some discussion about whether the P-51H should become a carrier-borne fighter and a single example was sent to the US Navy in August 1945 for trials but the advent of new jet fighters meant that the idea was dropped. Another P-51H was evaluated by the British at Boscombe Down.

The final P-51H was built in 1946. Although some units were issued with P-51Hs during the late summer of 1945, these were still being worked up to operational status and in the end the P-51H never saw combat.

Just one P-51M was built at Dallas and another order for 1700 P-51Ls, effectively a P-51H but with a 2270hp V-1650-11 fitted, was cancelled before any could be built.

A total of 15,586 Mustangs were built overall, including 100 airframes that were sent in kit form to Australia, though only 80 of these were ever actually assembled. •





## NORTH AMERICAN P-51D MUSTANG ▲

**The ‘Flying Dutchman’ was piloted by Lieutenant Roobert ‘Bob’ Goebel of the 308th FS, 31st FG. During a91-day peeriod, between May 29 and August 28, 1944, he shot downn 11 enemy fighters.**

# AIR FORCE RANKS

Air Force Ranks

| RAF | USAAF | VVS |
|---|---|---|
| Marshal of the Royal Air Force (MRAF) | General of the Army (5-star) (GA) | Glavnyy Marshal Aviatsiyi (Supreme Air Marshal) |
| Air Chief Marshal (ACM) | General (4-Star) (Gen.) | Marshal Aviatsiyi (Air Marshal) |
| Air Marshal (AM) | Lieutenant General (3-Star) (Lt.Gen.) | General-Polkovnik (Colonel-General) |
| Air Vice-Marshal (AVM) | Major General (2-Star) (Maj.Gen.) | General-Leytenant (Lieutenant-General) |
| Air Commodore (A/Cdre.) | Brigadier General (1-Star) (Brig.Gen.) | Mayor-General (Major-General) |
| Group Captain (G/Capt.) | Colonel (Col.) | Polkovnik (Colonel) |
| Wing Commander (W/Cdr.) | Lieutenant Colonel (Lt. Col.) | Podpolkovnik (Lieutenant-Colonel) |
| Squadron Leader (S/Ldr.) | Major | Mayor (Major) |
| Flight Lieutenant (F/Lt.) | Captain (Capt.) | Kapitan (Captain) |
| Flying Officer (F/O) | First Lieutenant (1/Lt.) | Starshiyi Leytenant (Senior Lieutenant) |
| Pilot Officer (P/O) | Second Lieutenant (2/Lt.) | Leytenant (Lieutenant) |
| Warrant Officer (W/O.) | Flight Officer (F/O) | Mladshiy Leytenant (Junior Lieutenant) |
| Flight Sergeant (F/Sgt.) | | |
| | Master Sergeant (M/Sgt.) | |
| | First Sergeant (1/Sgt.) | Starshiy Serzhant (Senior Sergeant) |
| Sergeant (Sgt.) | Technical Sergeant (T/Sgt.) | Serzhant (Sergeant) |
| Corporal (Cpl.) | Staff Sergeant (S/Sgt.) | Mladshiy Serzhant (Junior Sergeant) |
| | Sergeant (Sgt.) | |
| Leading Aircraftman (LAC) | Corporal (Cpl.) | Yefreyto (Corporal) |
| Aircraftman First Class | Private First Class (Pfc.) | |
| Aircraftman Second Class | Private (Pvt.) | Krasnoarmeyets (Red Army Man) |

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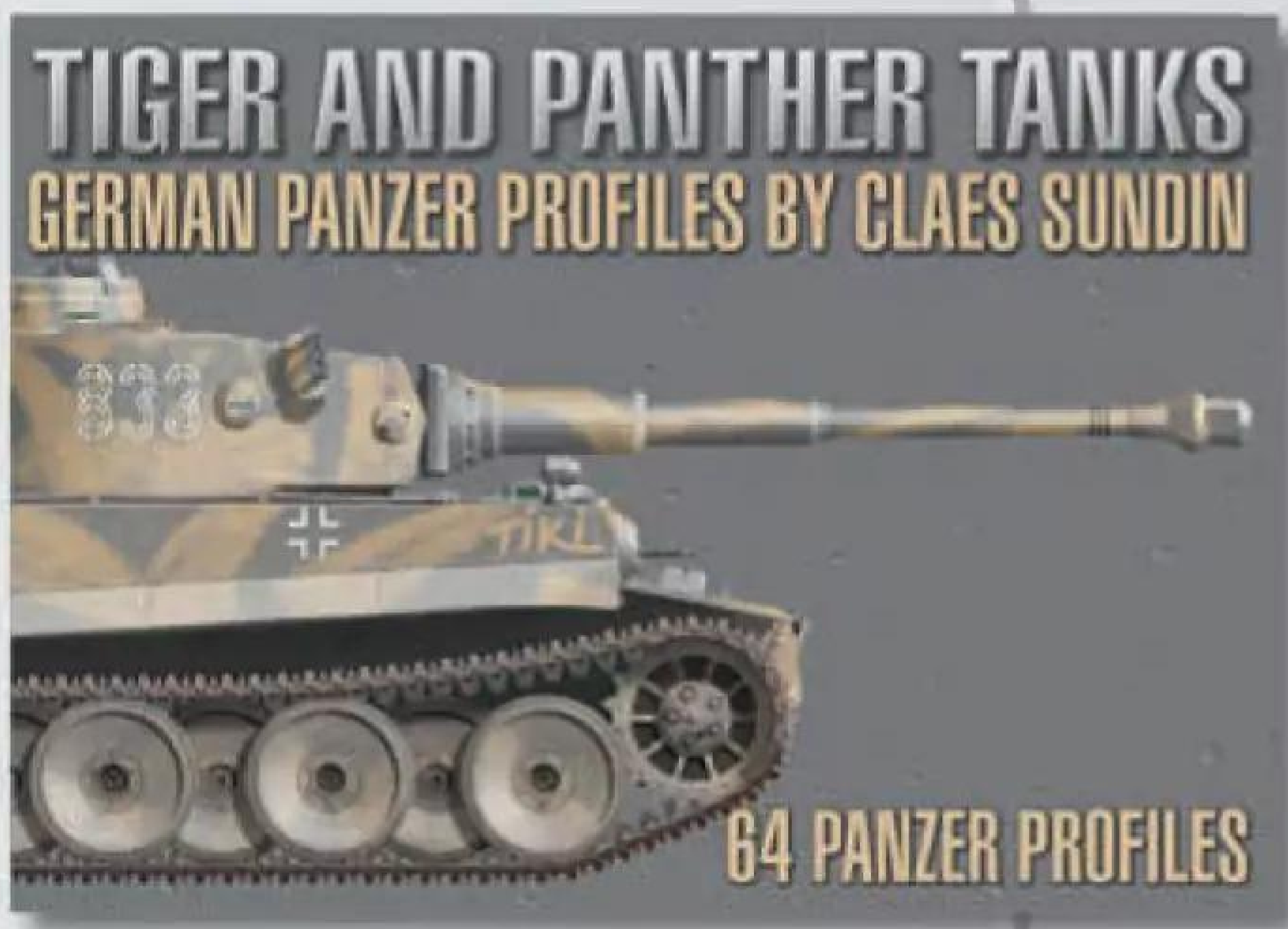
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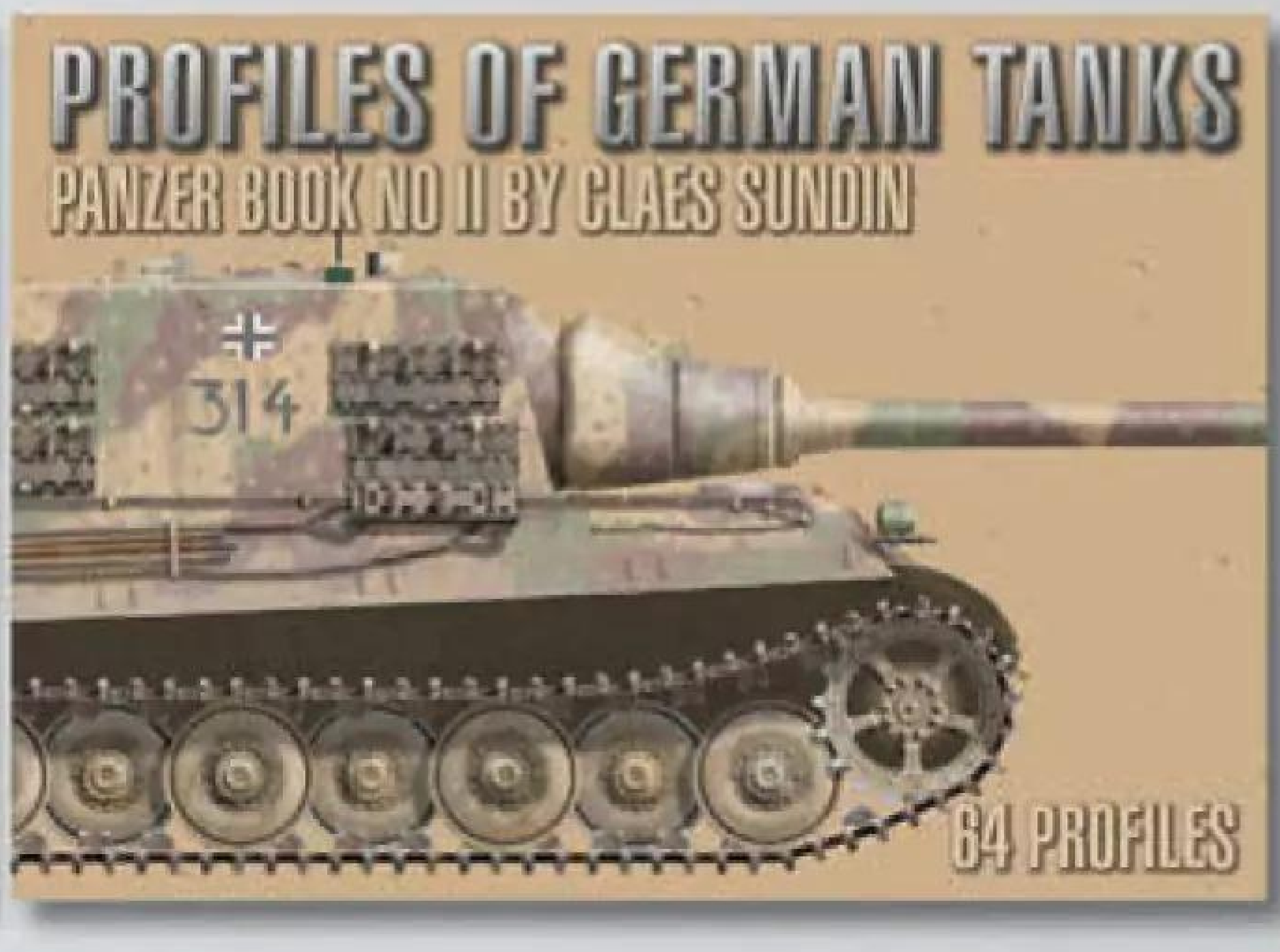
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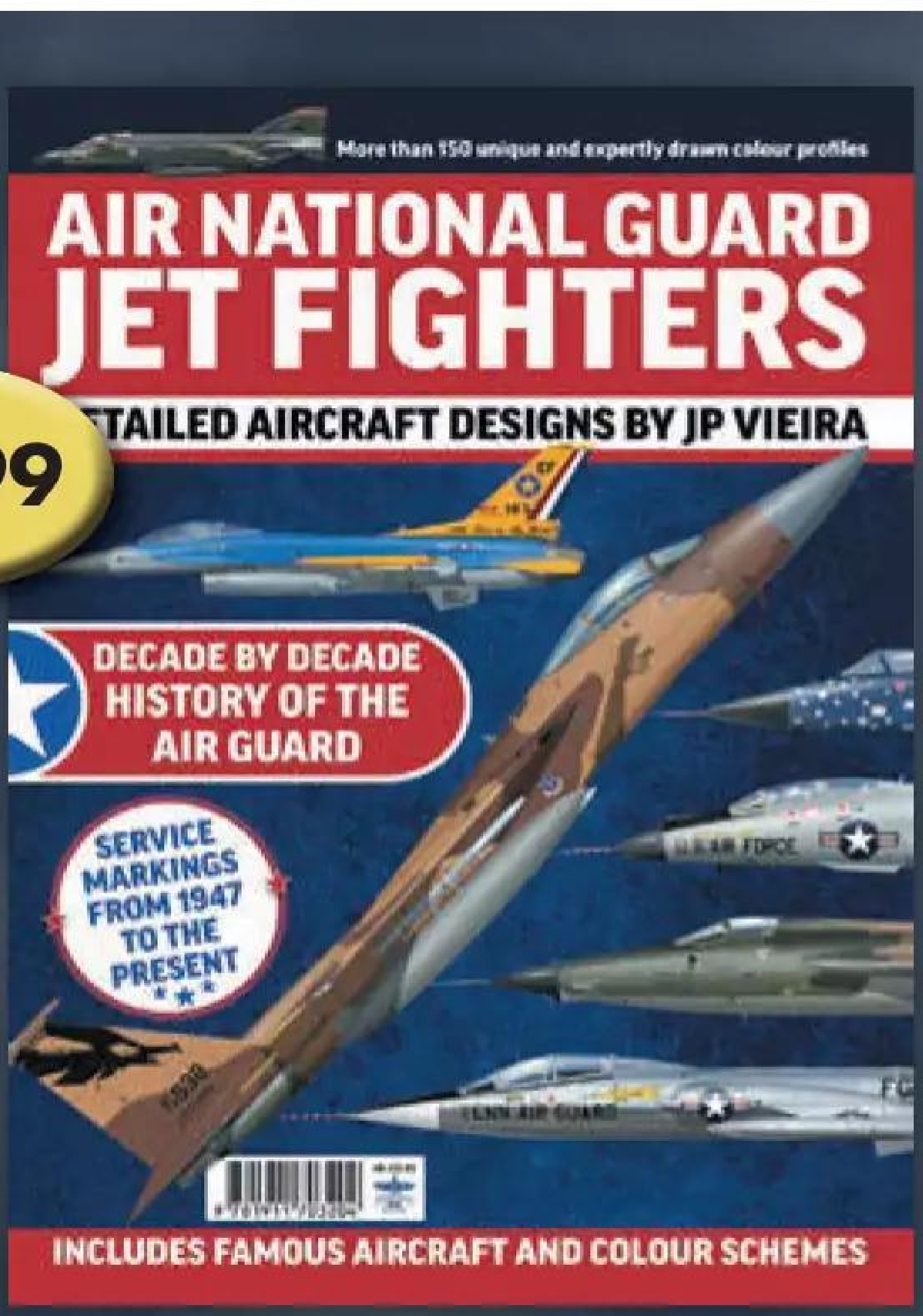
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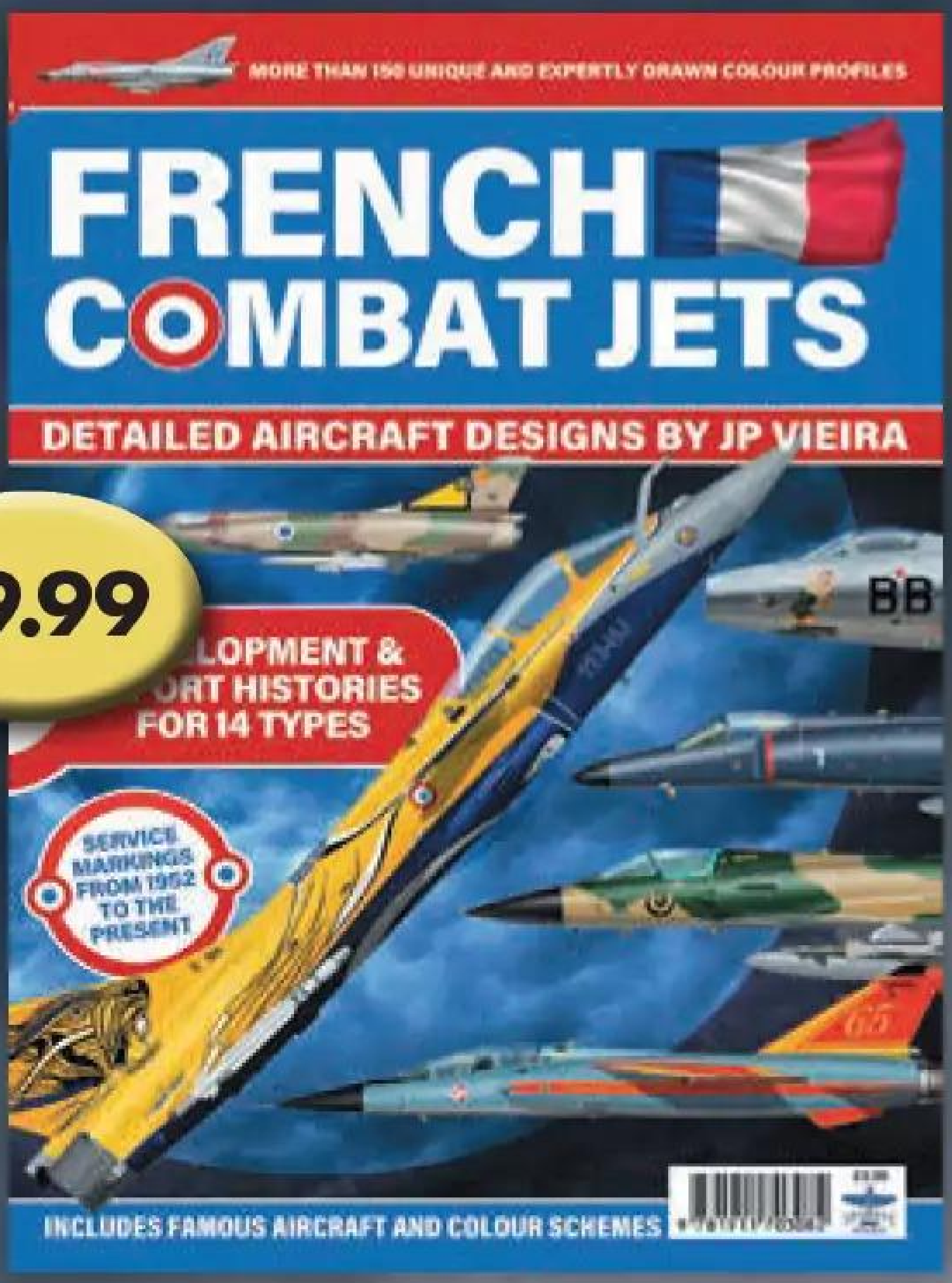
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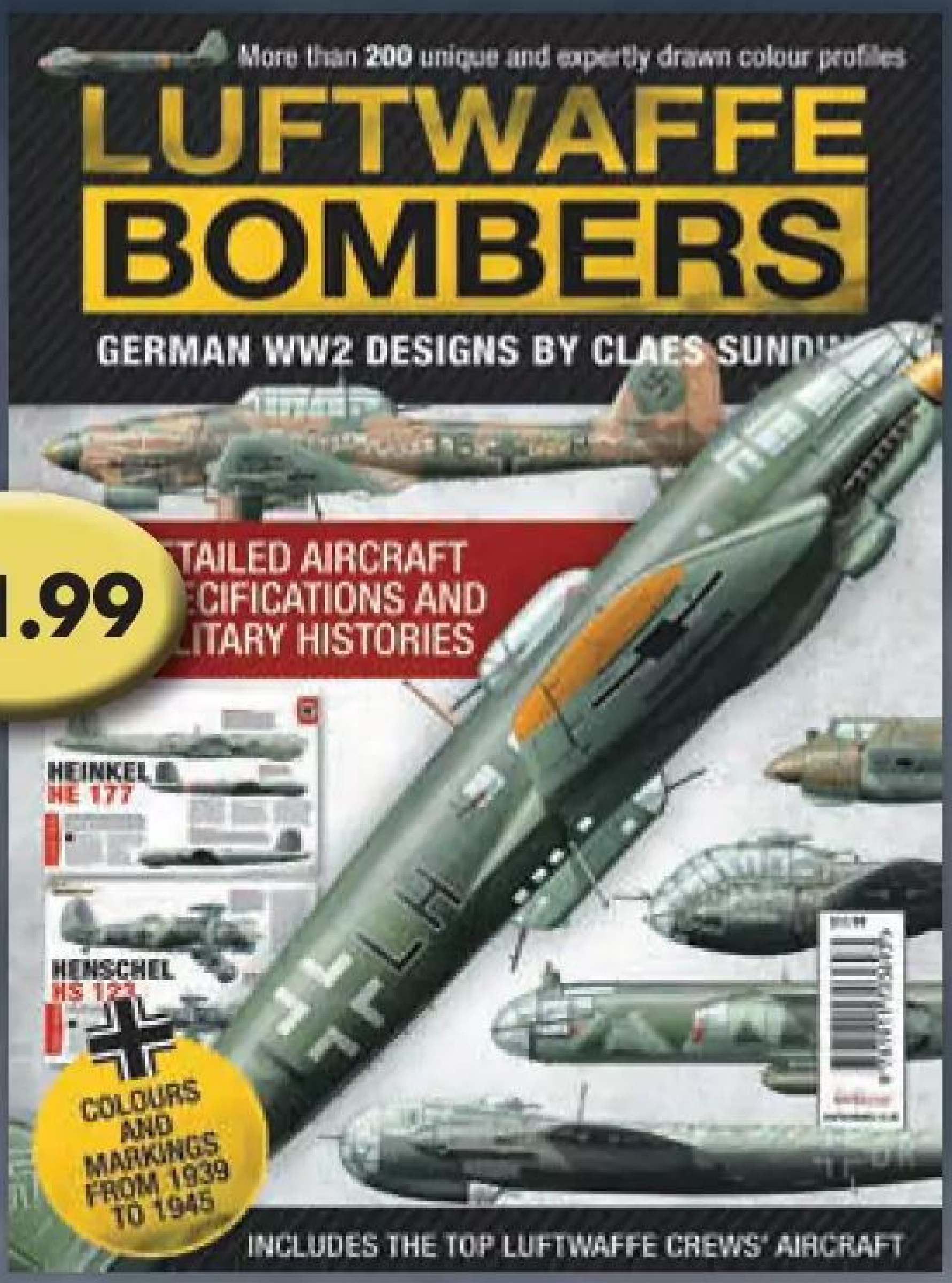
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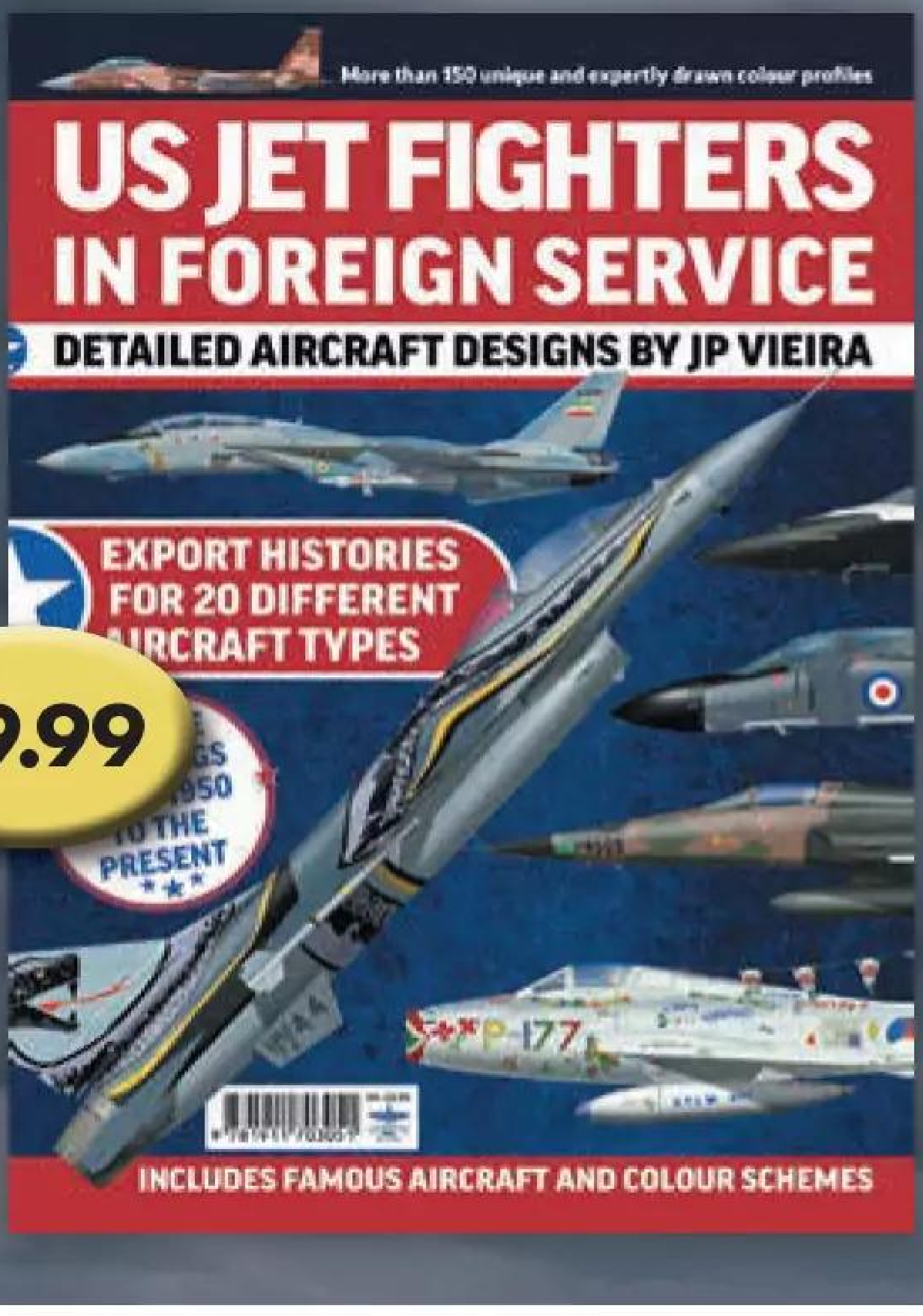
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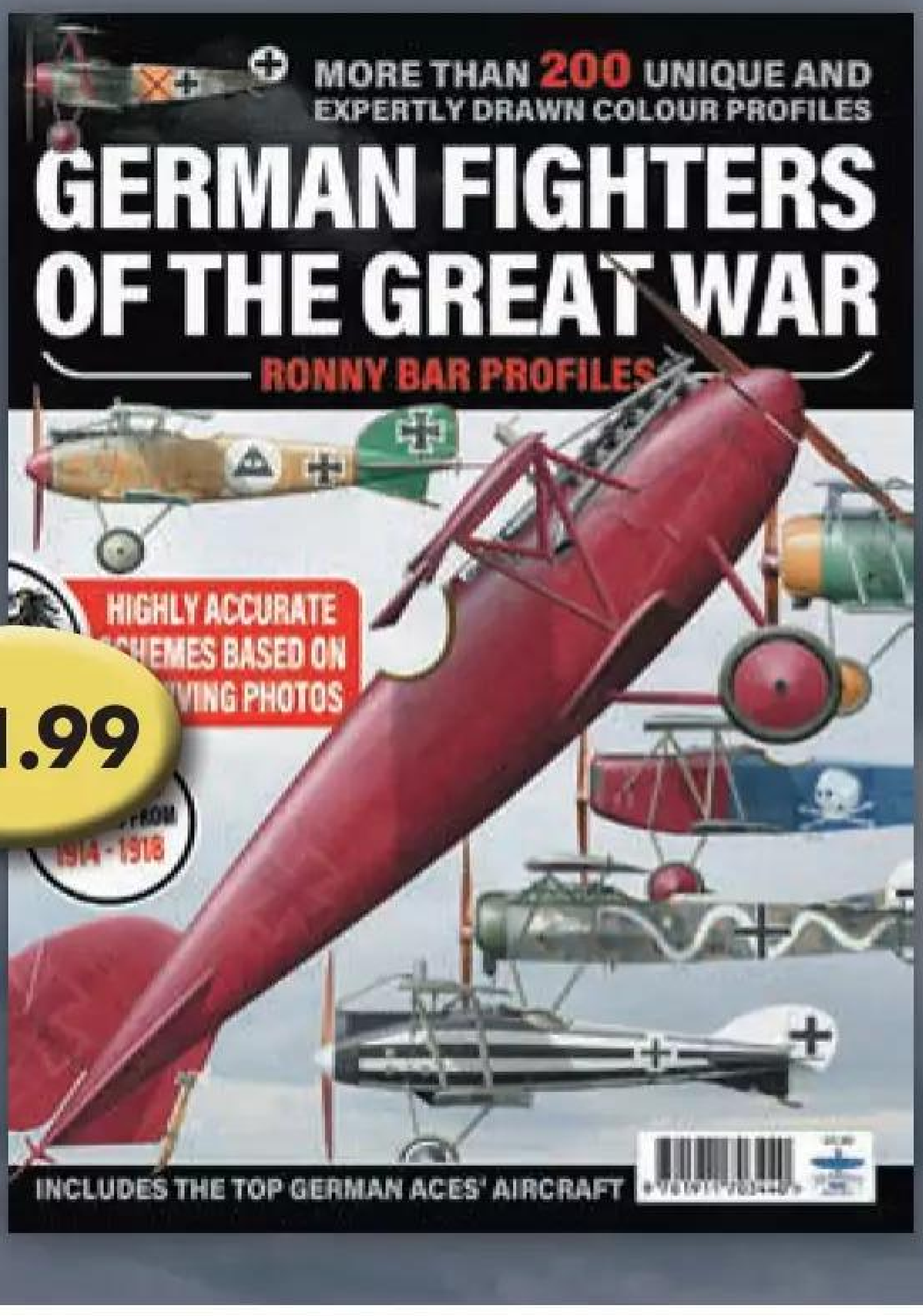
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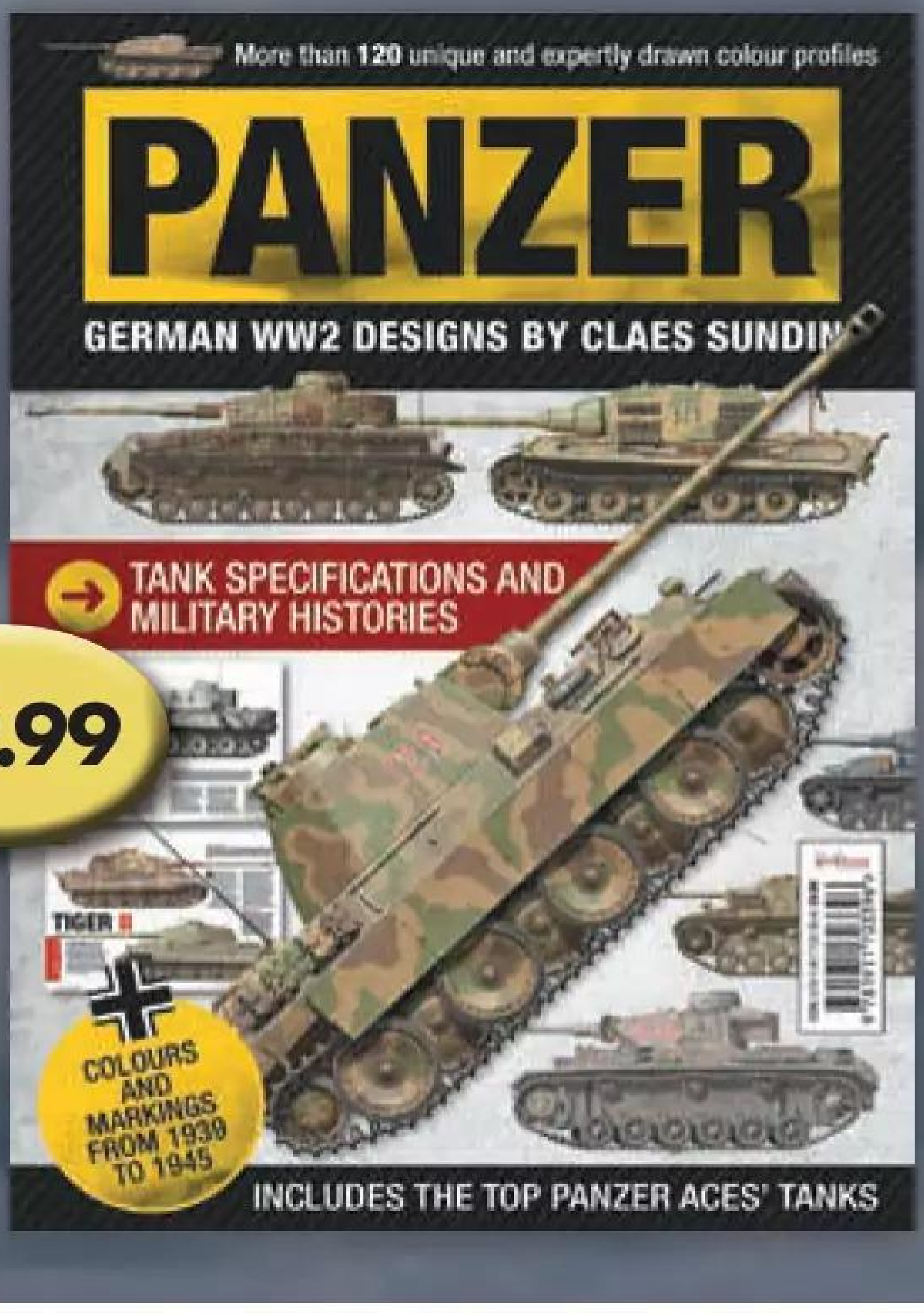
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